



FRIDAY, AUGUST 16, 1878.

## Contributions.

## On Car Axle-Boxes and Lubricants in Europe

BY WALTER R. BROWNE.

Having said thus much on the different classes of oils used as lubricants, we will now proceed to describe various types of oil axle-boxes, under the following heads:

- A. Boxes in which the oil is applied from above.
- B. Boxes in which the oil is applied from below.
- C. Boxes in which the oil is applied from above and below.
- D. Boxes fitted with cotton waste soaked in oil.
- E. Boxes arranged for rolling friction.

A. *Axle-Boxes for Oil, in which the Oil is Applied from Above.*—One of the best designed oil-boxes of this type still in use is the one employed on the Berlin, Potsdam & Magdeburg Railway, illustrated in figs. 17 and 18, fig. 17 showing a longitudinal section on the line *CD*, and fig. 18 showing a cross-section on line *AB*.

The oil-cup at the top of the axle-box is divided into two compartments, the forward part *a* receiving the oil, whence it is transferred by two wicks to the other compartment

only 0.0085 lb. of oil per axle-mile. The design has not been adopted by any other line, probably on account of its costliness and complicated construction. It of course obviates the difficulty common to boxes lubricated from above, viz., that the oil continues to flow even when the axle is at rest.

B. *Axle-Boxes in which the Oil is Applied from Below.*—The latest type of this class of oil-boxes,\* unites the following improvements:

a. They are provided with reliable felt or plush pads of simple and efficient construction acting as suction apparatus for the oil.

b. The dirty oil is kept separated from the clean oil, and the former is cleaned as much as possible.

c. They are securely closed, so as to prevent loss of oil and entry of dust.

d. They can be examined without loss of time.

e. The load is distributed uniformly over the journal by means of a movable brass, or by a peculiar connection between axle-box and bearing-spring.

f. The oil receptacles are made of such size that replenishing is only needed periodically at the railway shops after a run of say 3,000 miles.

All these conditions are fulfilled by Beuther's axle-box, of which we give illustrations: fig. 19 showing a longitudinal section on line *EF*, fig. 20 a cross-section on line *AB*, fig. 21 a plan of the lower half, fig. 22 an inverted plan of the upper half, fig. 23 a cross section on line *CD* and fig. 24 an end view and elevation of the brass.

On the inside of the lower half of the box projections *r, r*,

venting thereby loss of oil and entry of dirt and dust. The lower part of the box can be taken off, by unscrewing the bolts *c, c*, fig. 20, which are secured by right and left hand threaded nuts and split pin; when the brass requires to be examined the bearing-spring has to be compressed about 1½ in., by means of a winch; the brass can then be lifted out, the whole manipulation occupying less than 10 minutes' time. A semi-circular projection, *d*, fig. 19, is cast across the top at the inside of the axle-box, and a corresponding cavity is provided at the top of the brass, which is thus made to adjust itself longitudinally to the journal. The metal of the brass is made out of an alloy of 35 lbs. of tin, 8 lbs. of lead and 5 lbs. of zinc; with the addition of 7 lbs. of pure copper to each pound of the alloy. The oil compartment *m m* holds about 2¼ lbs. of oil, which is more than ample for a run of 2,500 or 3,000 miles.

At the end of 1867, 10,000 of Beuther's axle-boxes were in use on German and Belgian lines and on the South Russian Railway; all the reports are in its favor, and agree in the following particulars:

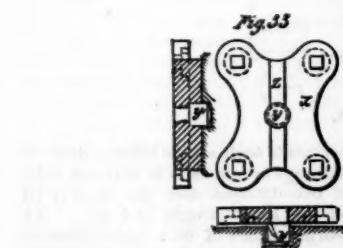
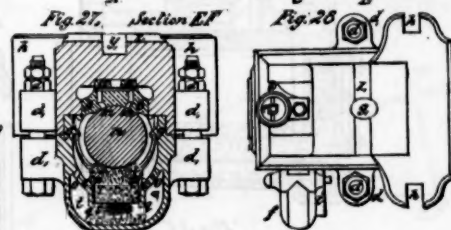
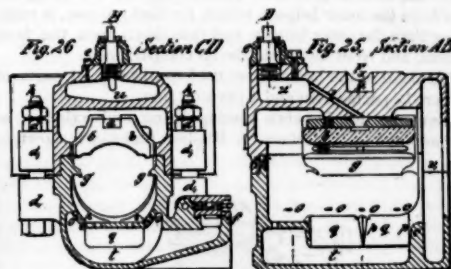
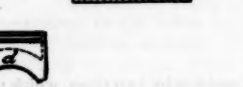
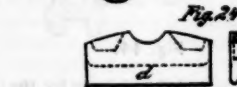
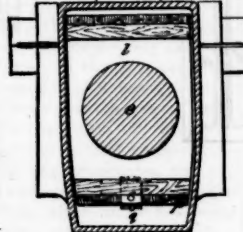
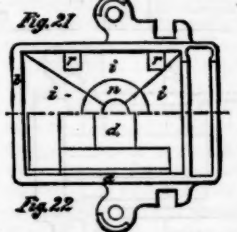
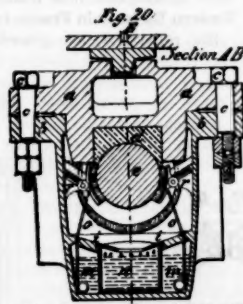
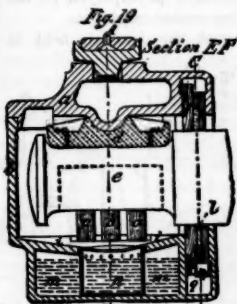
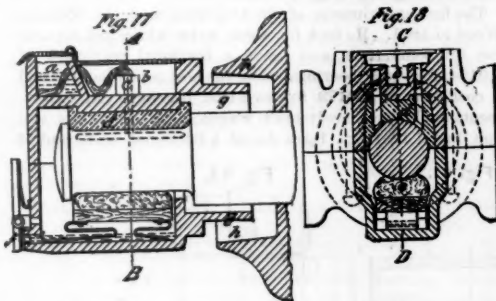
a. That the wear in the brasses is exceedingly slight.

b. That the axles are never known to heat.

c. That the oil consumption per axle-mile amounts only to about 0.0008 lb.

d. That after a seven months' run, the oil was yet in so liquid a condition that it would have served for a considerable time longer.

Since this time its use has extended, both on the continent and in England, where a company has been formed solely for its manufacture. It has not, indeed, taken root on Eng-



which is provided on each side with an oil hole *e*, communicating with grooves in the brass, which distribute the oil over the journal. The oil-holes are placed on both sides of the brass *d*, so as not to weaken it at the centre. The oil which collects at the lower part of the journal is distributed over it again by a pad *e*, which is kept in contact with the journal and clear of the dirty oil by springs, shown in fig. 17. The dirty oil collecting at the bottom of the axle-box can be withdrawn through a spring flap valve *f*, and utilized in the workshops. There is no especial preparation for closing the box at the back, but some patterns have a projection *g*, cast on, fitting inside a similar projection, *h*, on the wheel-boss to keep dirt and dust out of the box. There are 2,700 axle-boxes of this type running on the above line.

The brasses in use on this line are made of gun metal, composed of 10 parts copper, 1½ tin, 1¼ lead and ¼ zinc, and they last for a run of from 24,000 to 27,000 miles on passenger carriages. The lubricant used is rape oil, and the quantity consumed per annum per axle-mile amounted at a recent date to 0.00085 lb., which favorable result was chiefly due to the strict control kept over the replenishing, and to the premiums paid for economy. The number of heated axles only amounted to 0.5025 in 1863, and to 0.7858 in 1866 per 100,000 axle-miles.

A peculiar kind of oil-box is used for the coal trucks on the Palatinate railways. The oil which is kept in the lower part of the box, is pumped into the upper part by means of a small pump, fitted to the side of the axle-box, the pump piston containing a valve and the pump-rod being hollow and acting as delivery pipe. Motion is imparted to the pump by the play of the bearing-springs. A continuous drip of fresh oil on the journals is thus kept up as long as the trucks are in motion. These axle-boxes run for six or seven months without replenishing and consume

fig. 20, are cast, provided with slots to receive gun-metal brackets, which carry felt or plush pads, *s s*, through which ordinary lamp-wicks, *o o*, are made to pass. It will be seen that as soon as this pad is fitted into the brackets, *r*, it will of itself slide downward on account of the inclination of the latter, and be pressed against the journal by its own weight. The brackets are made to hinge so as to adjust themselves to the journal as the brass wears down.

The suction apparatus in this box cannot be put out of order (as is the case in the old type of boxes) by the breaking of a spring and the small particles of metal clinging to the journal cannot interfere with the oil supply, being free to drop down to the bottom of the box between the pads. The clean oil is put into the compartment, *m m*, and the dirty oil which drips off the journal runs down the inclines *i i*, and is collected in the case *n*, which is not in communication with the clean oil compartment *m m*. In the case *n*, which is made of zinc, the impurities contained in the dirty oil are allowed to settle, and the cleansed oil overflowing its top reenters the compartment *m m*. The case *n*, being loose in the axle-box, can be withdrawn and the dirt removed. The axle-box is closed at the back by a wooden collar, shown in figs. 19 and 23. It consists of two thin boards, *f* and *f'*, with a hole cut in them the exact size of the axle; they are made self-adjusting by means of a spring, *p*, fig. 23, fixed to one of the boards by a bracket, *q*, which tends to raise one board and depress the other, thus keeping them continually up to the shaft. A sheet of leather, *i*, fig. 19, is placed between the two boards, which keeps the backward board pressed against the back of the axle-box, pre-

\* Various attempts have been made to lubricate journals by means of cork or other floats, swimming in the oil at the bottom. This has been found, however, to thicken the oil very rapidly, and also make it liable to be split through the violent motion given to it.

lish main lines, but is very frequently specified by English engineers where oil-boxes are a necessity. The "Basson" axle-box is another type which is much in favor in Germany, but as its principles are much the same as the Beuther, we do not illustrate it.

C. *Axle-Boxes in which the Oil is Applied from Above and Below.*—This system is largely employed on the German lines, one half of their 500,000 axle-boxes being arranged for this kind of lubrication.

The most recent axle-box of this class is that employed on the Cologne & Minden Railway. Fig. 25 shows a longitudinal section of this design on line *AB*, fig. 26 a cross-section on line *CD*, fig. 27 a cross-section on line *EF*, and fig. 28 a plan. The top and bottom parts are held together by two bolts, *d d*, figs. 26 and 28, passing through the bosses *d d*, and connected by a rabbit joint, *k, k*, figs. 25 and 26, which is made with red lead, and prevents any lateral shifting of the parts. The bosses *d d* are not made to meet, so as not to interfere with the tightness of the rabbit joint when the bolts are screwed up. The bottom part of the box can be removed in the shortest possible time, by simply unscrewing the bolts *d, d*, as the lugs cast on for the axle-guards are wholly on the upper part of the box.

The oil cup *u* on top is provided with an opening, *e*, for filling in the oil. Out of the cup the oil is carried to the journal by a wick along the channel *l*, and thence through oil holes in the bearings *a* and *b*, into the grooves *m m*, which distribute it over the journal. Not more oil is to be filled into the axle-box than can be held by the bottom cup *t*, so that whatever quantity is poured into the top cup, the same must be left out of the bottom cup, otherwise oil will be wasted. In fig. 25, 26 and 27, *a* is a hardened steel plate to strengthen the brass bush *b*, which is made lighter than usual. The back



of this plate is slightly rounded or tapered, so as to allow it to adjust itself to the journal. The breadth of the bearing part of the brass is 52 millimeters (about 2 inches). The lower box is divided into two compartments by a false bottom *c*, as shown in figs. 25, 26 and 27. The oil flying off the journal is caught by the projections *g g*, and thrown upon the false bottom, where it drops some of its impurities before entering through the holes *o o*, and some notches and other spaces into the compartment *t*. A case, *p p*, fig. 27, containing a pad *r*, is placed in a square hole, which is cast in the false bottom, and provided with projecting guides *q q*, which prevent the pad from canting. Two spiral springs *s*, figs. 27 and 31, are fixed to the bottom of the case, which keeps the pad pressed against the axle. The spiral springs have been found to work best when they are made strong enough to carry 2½ lbs.

Figs. 31 and 32 show the riveted sheet-iron case for the pad, with the spiral springs fitted to it. Fig. 27 shows the arrangement of the felt and plush pad; *r r r* are 3 strips of felt, with strips of plush laid between them, and fastened to the case with thread. The nap is left on the face of the plush, as this has been found to act better than a cotton wick. All the oil-cups are closed by means of screws, which can only be opened by the officials; the lid *f*, of the bottom cup, is, in addition kept tight by a spring. The box is closed at the back by means of a wooden collar, packed with felt. This collar, as shown in fig. 29, is put into the chamber, *v*, fig. 25, at the back of the axle-box, and pressed against the opening by means of a flat spring *s s*, fig. 30, on each side.†

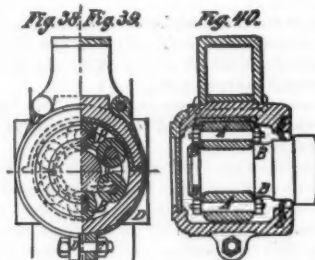
The oil, collecting at the bottom of the chamber *v*, fig. 25, overflows the inner ledge *c*, which, for that purpose, is made lower than the outer ledge *r*, and runs down upon the false bottom, and from there into the oil compartment.

The metal of the brasses here used consists of 84 parts of copper, 12 parts of tin and 4 parts of zinc.

The connection between bearing-spring and axle-box as now adopted on the Cologne & Minden Railway is shown in

of the box. The brass *D*, as shown in figs. 36 and 37, is of gun-metal, filled in with a composition of 90 parts of tin, 7 parts of antimony and 3 parts of copper. As will be seen, it bears only along the edges and at the centre, where there is a groove for the distribution of oil when required. These axle-boxes were formerly lubricated with rape or olive oil, but mineral oil has lately been introduced with great advantage, the cost per mile being reduced by 25 per cent. in consequence.

Similar axle-boxes are employed on the Emperor Ferdinand Northern Railway, where the wear on the brasses is said to have amounted to 1 lb. per brass only after a run of 6,000 miles. The advantages of these boxes are that they are completely closed; but they are very expensive to keep



in cotton-waste, and large quantities of oil are wasted at the refilling with waste, which has to take place every 9 or 12 months. In addition it was found on the Austrian railways that a large proportion of the axles (5 per cent.) ran hot, and in consequence this form of box has there been condemned.

*E. Axle-Boxes with Rolling Friction.*—Figs. 38, 39 and 40 show an axle-box with rolling friction as employed on the Eastern Railway in France for traversing carriages.

Six rollers, *A*, are placed round the journal, held in

so as to absorb the least power and reduce the chances of the axles heating.

3. It is not to be a costly material.

The experiments made on the Royal Austrian Southern Railway gave the cost of metal used per 1,000 axle-miles as under:

For gun-metal alloys.....	3.05 pence
For tin alloys.....	3.82 "
For lead alloys.....	1.82 "

The lead alloys, therefore, are the cheapest, but they are not capable of withstanding the pressures found with modern wagons; tin alloys, however, have been found to withstand these pressures well. In case the axle heats, no abrasion of the journal takes place if tin or lead alloys are used for the bearing, but abrasion commences instantly if gun-metal brass becomes hot. The gun-metal brasses, on the other hand, are not so soon worn at the ends, and therefore last longer than the others, but require more careful fitting in the first instance. In England various white metals or other alloys, such as "phosphor bronze," have been tried with more or less success, but gun metal is by far the most general material. Thus the standard alloy for one of the leading English railways is as follows:

Copper.....	84.21 per cent.
Tin.....	14.47 "
Spelter.....	1.32 "
	100.00 "

#### ON THE FRICTION OF RAILWAY JOURNALS.

We propose to give on this head results from various experiments specially made with the journals of railway axles; those made on ordinary journals are not applicable, the conditions being materially different.

The first experiments of the kind were made by Nicholas Wood in 1831. He took for them axles which had been in use for some time, and found a frictional coefficient of 0.0194, for brass bearings, using the best neat's-foot oil, and a coefficient of 0.0179 for cast-iron bearings. In experiments made on a newly-built wagon, with iron axles and gun metal bearings, Egen found a frictional coefficient of

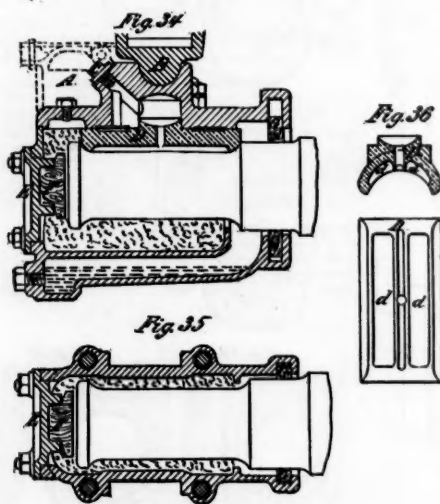


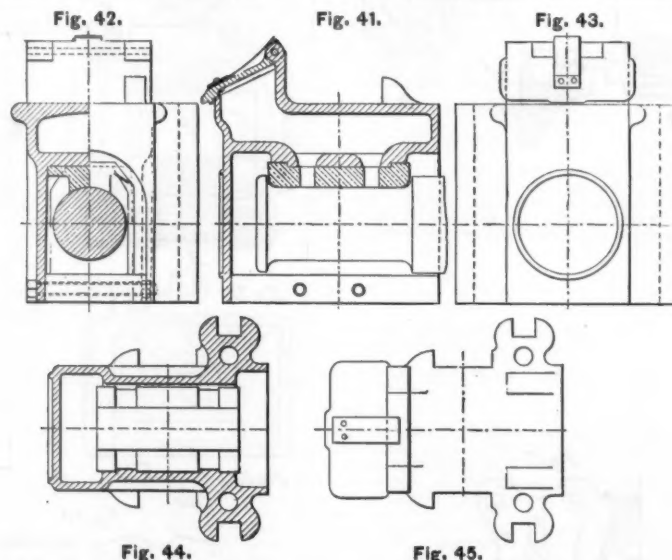
fig. 33. The wrought-iron plate *a* is provided with a semi-circular projection *z*, a corresponding cavity being cast on the top of the axle to receive it, and a pin, *y*, is screwed into it (or, better, welded on it), which, working in an oval hole, *y*, on the top of the axle-box, keeps the latter from shifting. The spring is held together by four bolts, as shown. The advantage of this plate over the ordinary spring buckle is that the bearing-spring can be more easily examined at its middle part, that it is much simpler to make, and that the bottom spring plate is much better secured against canting and shifting.

Several other forms of axle-box, lubricating both from above and below, are in use on German and Swiss railways, but it is, perhaps, unnecessary to describe them here.

*D. Axle-Boxes Filled with Cotton Waste Soaked in Oil.*—This kind of axle-box, originally introduced by Lightner, in America, is successfully used on the Empress Elizabeth Railway of Austria. Fig. 34 shows a longitudinal section, and fig. 35 a sectional plan.

At first this box was provided with an oil-cup *A*, as shown in dotted lines; but the opening was found to admit snow and rain into the box, which caused the axles to heat, and in consequence the cup was done away with. Six thousand five hundred of these axle-boxes were in use on the above line, when reported on. The buckle of the bearing spring is provided with a spherical projection at the bottom, which works into a spherical hole at the top of the axle-box. In case of need, oil can be poured directly into the box by taking off the plug *C*. A wooden stopper, *F*, is fixed to the inside of the front end *E* of the axle-box, to prevent any motion in the direction of the axle when the brass is worn away at the ends. The axle-box is closed at the back by a wooden collar *G*. When it is to be put in working order the front cover *E* is first of all taken off and the whole box filled with cotton-waste, which has been previously soaked in oil. By entirely surrounding the journal this oily cotton-waste keeps it continually lubricated. The superfluous and dirty oil is squeezed out at the back, and collects in a cup at the bottom

† The collar is sometimes made self-adjusting, as shown in fig. 30, where the felt which is placed between the two boards is squeezed by a spring, which keeps it continually pressed against the axle.



position by two rings, which are provided with holes for the ends of the rollers to work in.

The two halves of the axle-box are held together by a wrought-iron band, *B*, and the back of the box is closed by a leather collar, which prevents the oil from being wasted.

This axle-box cannot be used for speeds exceeding 15½ miles per hour, and its complicated construction prevents it being employed largely. A box of this construction, but with 18 rollers, was, however, shown at the Paris Exhibition of 1867, as applied to one of the two-storied passenger cars of the Eastern Railway of France. This same plan was tried for tenders by Mr. R. Sinclair, of the Great Eastern Railway, in 1863, but without being carried further. Figs. 41 to 45 represent the axle-box used on the Great Western (English) Railway.

#### ON THE VARIOUS KINDS OF METAL USED FOR THE BRASSES OF AXLE-BOXES.

The alloys principally used on the German railways for axle brasses may be classed as follows:

1. Gun-metal alloys.
2. Tin alloys.
3. Lead alloys.

The gun-metal alloys consist chiefly of copper, the proportion of which varies between 75.5 per cent. and 87 per cent. They also contain between 8 per cent. and 20 per cent. of tin, and sometimes a small percentage of zinc and lead.

The tin alloys contain between 42.5 per cent. and 93.3 per cent. of tin, and between 4.6 per cent. and 16.7 per cent. of antimony, and between 1.5 per cent. and 16.75 per cent. of copper; sometimes also from 20 per cent. to 43.75 per cent. of lead.

The lead alloys contain between 60 per cent. and 88 per cent. of lead and between 4 per cent. and 20 per cent. of antimony, and sometimes between 12 per cent. and 20 per cent. of tin.

The metal to be used for the brasses of axles must fulfill the following conditions:

1. It has to withstand a pressure or crushing strain varying from 120 to 1,500 lbs. per square inch.
2. It has to produce the least possible amount of friction

0.036. At some experiments made at the railway shops of the Bavarian State Railways by von Pauli in 1847 and 1848, journals were used of two different sizes; the one was 60 millimeters diameter by 120mm length [2.4 in. × 4.8 in.], representing a bearing surface of 63.2 square centimeters, and the other 68mm in diameter by 146mm length [2.7 in. × 5.8 in.] representing a bearing surface of 85.9 square centimeters. The speed was about 230 revolutions per minute. Ten different alloys were tested for the bearings, and the coefficients of friction in the larger journal, with a load of 38.5 lbs. per square centimeter, were found to vary between 0.00891 and 0.013. The following conclusions were drawn from these experiments: 1. Under the above conditions, the mean coefficient of friction for the various alloys in the bearings increases 78 per cent. when the pressure increases 36 per cent. 2. By properly arranging the proportion between pressure and size of journal the friction can be reduced considerably below the above figure.

Two other sets of experiments were made at the railway shops at Göttingen and at Hanover in 1861 and 1862. In the former case the journals were made especially for the experiments, and were 114mm, 89mm and 70mm in diameter by 216mm, 191mm and 140mm in length [4.5 in., 3.5 in. and 2.8 in. diameter, by 8.6 in., 7.6 in. and 5.6 in. long]. The speeds were 80, 160 and 320 revolutions per minute; the loads were 2,500, 5,000, 7,500 and 10,000 lbs. per journal, and two gun-metal alloys, one tin alloy and one lead alloy were tried for the bearings. The conclusions drawn from these experiments were as follows:

1. That the friction increases with the load, and in a considerably higher ratio.
2. That the friction increases with the velocity, but not in the same proportion as with the load.

3. That gun-metal bearings have been found to produce the least friction, but that they require more careful fitting.

At Hanover various iron and cast-steel axles were employed for the experiments, all having been in use for some time. The journals of the iron axles were 89mm [3.5 in.] diameter by 140mm [5.6 in.] length. Those of the cast-steel axles were 70mm diameter by 140mm length [2.8 in. × 5.6 in.]. The speed was 180



and 360 revolutions per minute. The loads were 321, 631, 941 and 1,251 lbs. per journal. One gun-metal, one tin and one lead alloy were used for the brasses. The inferences drawn from those experiments were as follows:

1. The coefficient of friction for iron and cast-steel axles, when lubricated with rape oil or cohesion oil, and with bearings of tin alloys or hard lead, is between 0.009 and 0.0099.
2. For the same axles, with gun-metal bearings, the coefficient is 0.0141.
3. The coefficient of friction, for such loads as occur on railway vehicles, is independent of the load, consequently a smaller or larger bearing surface of the journals is (within certain limits) of no influence on the friction.
4. The coefficient of friction, for such velocities as occur in railway vehicles, is independent of the velocity.
5. When grease is used as the lubricant, the coefficient of friction is greater than with oil for small loads, but for heavier loads, where the journals become warm more quickly, the coefficient of friction is the same for grease and oil, except at starting.

These different sets of experiments give, therefore, very different results, and the discrepancy can only be accounted for by differences in the apparatus used for them. Such being the case, the results obtained by means of the least complicated apparatus, are to be considered as the most reliable. On this ground the last series of experiments may be accepted as the most reliable, since they were made with the simplest kind of apparatus and since the axle-boxes and axles employed for them were taken from actual stock in use. Their coefficient of friction for oil-boxes agrees closely, as will be seen, with the Bavarian experiments. It is further confirmed by some experiments made on the London & Southwestern Railway (v. Trans. Inst'n Civil Engineers, vol. 28, p. 410), to determine the resistance with oil as compared with grease axle-boxes. The carriages here weighed about 6 T. 4 cwt., and the tractive force, in pounds per ton weight, required to keep them in motion was as follows, for seven different experiments: 2.8, 2.6, 2.9, 2.2, 4.0, 2.6; giving a mean of 2.85. It must be noted, however, that the bearings were of white metal and the loads small, both of which circumstances would tend to diminish the resistance.

Assuming the diameter to have been 10 times that of the journal, this average result gives a coefficient of  $\frac{2.85}{2.240}$ , or

0.0127, for oil axle-boxes with white metal bearings. More recent experiments have given, it is said, still lower results for oil, so that on the whole we may safely assume that the coefficient of friction for gun-metal bearings well lubricated with oil is 0.014, and for white metal bearings 0.012; and that these coefficients, within certain limits, are independent both of the area of bearing surface (or the load per square inch), and of the speed at which the axle is moving.

Experiments with regard to the friction of journals lubricated with grease have been few, but there appears reason to conclude that it is far higher than with oil; e. g., it is stated by Mr. E. A. Cowper, at 8 lbs. per ton load, as against 2.85 lbs. given above for oil. It may seem difficult to reconcile this result with the existence of grease axle-boxes on railroads at all. This article may, therefore, be fitly concluded by a few remarks on the general question of oil *versus* grease axle-boxes. It is curious how much uncertainty and difference of opinion still exists upon this subject. It has been twice debated by the Institution of Civil Engineers; first in 1868, in discussing a paper by Mr. Zerah Colburn on "American Rolling Stock," and next in 1876, in discussing two papers on "Wagon Construction," by Messrs. Walter R. Browne and W. A. Adams. On the first occasion the cause of oil appeared to be generally gaining ground among English engineers. The author of the paper, Mr. Harrison, of the Northeastern Railway, Mr. E. A. Cowper and others all spoke strongly in favor of oil, and it appeared to be rapidly superseding grease on the main English lines. But in 1876 things had undergone a change. Mr. Clayton, Superintendent of the Carriage and Wagon Department of the Midland Railway, in speaking on the subject, stated that "the fastest trains and those having the longest trips in England were all running with grease. The London & Northwestern, the Great Western and the Midland companies had experimented on the subject for years, and they had returned to the use of grease for all main line trains. Three years before the Midland Company had about 1,500 carriages working with oil, using about £3,000 worth of oil per annum. They had been fitted up within three or four years with the best known oil-boxes, yet it was found that in the carriages running with oil there were four times as many hot boxes as there were in the carriages running with grease. Now that the company had returned to the use of grease, only one-fourth the number of axle-boxes became heated, as compared with those that were heated three years before."

This opinion Mr. Clayton still holds, and the standard grease axle-box, illustrated in this article, is now the only type in use for carriages and wagons over the whole of the Midland Railway system. The same applies to the Great Western and other main lines; and although it was stated by another speaker that the London & Northwestern still preferred oil for carriages, yet it was admitted they had abandoned it for wagons.† As to the actual figures with regard to the two materials, the discrepancies were at first sight wholly unaccountable. Thus, Mr. W. H. Barry stated that on the Southeastern Railway it was found that with first-class oil, costing 5 shillings per gallon, an axle-box would only use about 1½ pints per annum, costing about one shilling. On the other hand, Mr. Clayton gives £3,000 as the annual cost for 1,500 carriages, or 6s. 8d. per box,

† In England, what we call "passenger cars" or "coaches," are called "carriages"; and what we call "freight cars" are called "wagons."—EDITOR RAILROAD GAZETTE.

allowing six wheels to a carriage. Again, the reason why oil was abandoned on the Midland Railway was stated to be the number of hot boxes; yet, by other speakers it was put forward as one of the special merits of oil-boxes that, on account of their heating gradually and not rapidly, when short of oil, they were much more likely to be detected, and thus that hot-boxes were rendered much less common.

So far as can be gathered from the various statements put forward, the real state of the case appears to be as follows: With regard to cost, the amount, whether of oil or grease, actually consumed by an axle-box in fair running, is a matter of but small importance; because it is never more than a fraction of the amount debited to the vehicle in the course of a year. By very much the largest portion of this is wasted in various ways, which it would be too long to particularize. This is made more clear by an instructive experiment on the consumption of grease made on one of the English main lines, the details of which may be shortly given. A train of six carriages, making daily a backward and forward trip between two towns about 150 miles apart, had its 36 axle-boxes filled alternately with two kinds of grease of the following compositions:

	No. 1, per ct.	No. 2, per ct.
Tallow.....	22.0	24.6
Palm oil.....	7.6	9.8
Palm soap.....	22.0	
Rape oil.....		1.1
Soda.....	3	5.2
Water.....	48.1	59.3
	100.0	100.0

The train was run in this condition for 10,000 miles, every care being taken that the grease used was accurately taken account of and weighed; at the end of that time the loss of No. 1 grease was 43 lbs., and of No. 2, 34½ lbs. This showed a great superiority in the grease made with soda over that made with palm soap, but taking the two together it will be seen that the consumption per 100 train-miles was only 0.77 lb. On the other hand the statement of the total consumption of grease on the same line of railway for several successive half-years shows that the average per 100 train-miles varied from 8.96 to 6.86 lbs., or something like nine times the rate actually obtained from the experimental train. Of course this average includes goods-trains, in which the number of axle-boxes would be, in general, much above 36; but making all allowance for this, it is evident that the consumption due to actual working must be small in comparison with that due to waste. Probably in the case of oil this proportion would be smaller still, because, in the first place, oil being a liquid, is much more easily wasted; and, in the second place, being at once much more valuable than grease, and applicable to many more uses, it offers far greater temptations to theft. This, in some Eastern countries, where the natives are glad to appropriate it for drinking or cooking, has been found a most serious evil, and nearer home there can be no doubt that a large portion of the waste may thus be accounted for. Here then we have the very substantial advantages on the side of grease: (1) that it is less liable to be wasted; (2) that what is wasted is of a much smaller prime cost; from which it must result that the cost of working with grease will be much less than with oil, whatever saving there may be with the latter in actual consumption when running. As counterbalancing advantages, the advocates of oil would probably plead: (1) the much smaller cost of inspection and maintenance, since an oil box, once filled, will run for months without being touched, while a grease box requires frequent overhauling; (2) the better lubrication, and consequently diminished friction, as shown by the London & Southwestern experiments and others. There may, however, be a rejoinder to make on both these points. As to the first, it is probable that the frequent inspection of grease boxes is exactly what brings their average of failures by heating so much below that of oil boxes, as it is stated by Mr. Clayton to be. Supposing, for example, that with an oil box the chance of heating as compared with a grease box is only one-fourth, yet if the latter be examined four times as frequently as the former, the number of hot boxes occurring in practice will obviously be the same. And in addition the more rarely any operation is performed the more likely it is to be slurred over or forgotten; and hence probably oil-boxes will fail to receive even that amount of attention which is properly due to them.

As to the other advantage of diminished friction, it does not appear quite certain how far this holds where the load on the journal is heavy. The London & Southwestern experiments were certainly tried with the carriages light, and probably also those on the French railways. It seems probable *a priori* that where the pressure is great, there arises a danger of the liquid oil being squeezed out altogether from between the bearing surfaces, and these latter being left without any lubrication whatever. There would be less liability to this with the more solid grease. This appears from the experiments at Hanover given above, and is further confirmed by a remark of Mr. T. W. Emmett in the course of the discussion at the Institution Civil Engineers in 1875. He stated that the London & Northwestern Railway had fitted oil axle-boxes to some 50-ton trolleys, constructed to carry great weights; that the axles gave continual trouble by heating, and required a large quantity of oil to be sent out with the trolleys every time they were used; and that this had finally been cured entirely by substituting grease for oil-boxes. To clear this point up entirely it would be desirable to make experiments on both oil and grease boxes with gradually increasing loads, so as to determine the point at which the resistance with oil becomes equal to that with grease and at which the tendency to seize commences. If this is within the ordinary loads placed on carriage or wagon axles (which are in general larger in England than in America or on the Continent) this would afford a

justification of the English wagon superintendents for returning to the old material.

It would thus appear that the users of grease-boxes may perhaps have a better case to plead for themselves than would at first sight be imagined. It is perhaps one of those instances in which the clearest theoretical advantages are in great measure neutralized by indirect and obscure obstacles in practical working. It is not, of course, forgotten that grease, as a lubricant, is necessarily confined to temperate climates. Under extremes of heat or cold it is equally useless, on account of the relatively high temperature at which it freezes, and the low temperature at which it melts. For this reason oil is universal in tropical countries, and on a great part of the Continent. Nor is it at all asserted as an indisputable fact that grease is to be preferred even where it may be used with safety. It has only been attempted to show that English carriage and wagon superintendents are not altogether without reason in the persistency with which they cling to that unsavory compound. Some further experiments and a fuller discussion are all that is needed to complete the comparison between the two classes of lubricants, and it is to be hoped that before long these may be supplied.

#### Form of Screw Thread for Transmitting Power.

ST. LOUIS, April 26, 1878.

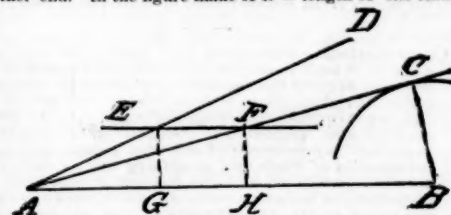
TO THE EDITOR OF THE RAILROAD GAZETTE:

The question was put to me the other day by the foreman of a machine shop, "What kind of a screw-thread and what pitch is the most efficient in transmitting power?" and the solution may interest some of your readers. A word of explanation, however: the question is not meant to be understood what is the most powerful screw, but if say one horse-power a minute is put to turning a screw-jack, what will give the most power in foot-pounds per minute that you can expect to get.

The threads with least friction are square threads, and the effect of a V-thread is only to increase the friction.

The efficiency of any square thread can be easily found by a little diagram, as follows:

Set off the angle made by the thread with a surface at right angles to the body of the screw (for instance the under side of a common nut) by drawing a line equal to the length of one turn of the thread; and from one end of it, with the pitch or distance between the same thread, along the body, as a radius, swing an arc, and draw a tangent to it from the other end. In the figure make  $AB$  = length of one turn of



thread  $CB$  = pitch. Draw  $AC$  tangent to arc from  $B$  or make  $ACB$  a right angle; then set off  $CAD$  = the angle of friction. Then  $DAC$  is the angle of elevation down which a smooth, oiled metal piece will slide on a similar surface;  $CAD$  is from  $2^\circ$  to  $4^\circ$ , according to the finish or the condition of the surface and the oil used. For V-threads the angle will be from  $3^\circ$  to  $8^\circ$  according as it is nearly square or flat. After drawing the lines  $AB$ ,  $AC$  and  $AD$ , making the desired angles, draw any line parallel to  $AB$ , cutting  $AC$  and  $AD$  in  $F$  and  $E$ ; draw  $EG$  and  $FH$  perpendicular to  $AB$ . Then will the useful work obtained be to the energy exerted as  $AG$  to  $AH$ .

For a square thread it may be proved by drawing out for many screw angles, that when  $BAC$  is nearly  $43^\circ$  this ratio is the largest, or by other methods. The problem of maximum efficiency has in itself little interest, but the problem, for instance, if I am to lift a weight of say 33,000 lbs. 1 ft. in one minute by screws, how many horse power have I got to pay for is more interesting, and one which is readily solved by this construction; for if  $AG$  be taken to represent one horse-power, or the 33,000 lbs. lifted 1 ft.,  $AH$  will represent the horse-power required.

The methods employed in this question are by no means original, but I do not remember the construction here given.

CHAR. A. SMITH.

#### The Title to the Troy & Greenfield Railroad.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice, in your paper of the 9th inst., a few lines relating to the Troy & Greenfield Railroad Company, stating that the company keeps up its organization, although the road has been owned by the State of Massachusetts for years.

This is a mistake; allow me to correct it by the following quotation from the report of the Judiciary Committee of the Senate of Massachusetts, April 29, 1878:

"There appears to be no question that the title of the Commonwealth in this property is simply that of a mortgage without power of sale, in possession for the purpose of foreclosure, with the ordinary rights as against said railroad company, the mortgagor of such a mortgage, except as they are modified by the act of 1862, Chap. 156, and the deed and contract thereunder in accordance with which the property was surrendered to the State and is now held. Nor does there seem to be any question that under this act, deed and contract the mortgagor or its assigns has the right to redeem the property from the mortgage by paying the amount due thereon, including such outlays for the improvement of the property as the mortgagee had a right to make, for ten years after the tunnel is completed and opened for use, or that the ten years commenced to run July 1, 1876, and will expire July 1, 1886."

A.





Published Every Friday.

CONDUCTED BY  
S. WRIGHT DUNNING AND M. N. FORNEY.

## CONTENTS.

ILLUSTRATIONS:	Page.	EDITORIALS:	Page.
Car-Axle Boxes.....	399, 400	Record of New Railroad Construction.....	403
Screw Threads.....	401	EDITORIAL NOTES.....	403
Graphic Solution of the Train Problem.....	404	GENERAL RAILROAD NEWS: Meetings and Announcements.....	404
CONTRIBUTIONS:		Elections and Appointments.....	404
On Car-Axle Boxes and Lubricants in Europe.....	399	Personal.....	405
Form of Screw Threads for Transmitting Power.....	401	Traffic and Earnings.....	405
The Title of the Troy & Greenfield Railroad.....	401	The Scrap Heap.....	406
Another Graphic Solution of the Train Problem.....	404	Old and New Roads.....	406
EDITORIALS:		ANNUAL REPORTS:	
The Last Crop Year.....	402	St. Paul & Sioux City.....	407
The Chicago & Northwestern Report.....	402	Chicago & Northwestern.....	408
		Sioux City & St. Paul.....	408
		MISCELLANEOUS:	
		Running the Fast Train.....	404

## EDITORIAL ANNOUNCEMENTS.

**PASSES.**—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

**ADDRESSES.**—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

**ADVERTISEMENTS.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

**CONTRIBUTIONS.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

## THE LAST CROP YEAR.

After all, the industry which in this country makes most rapid progress seems to be agriculture. Perhaps this is apparent only, and the much more rapid growth of towns than of the country population would seem to prove the contrary; but traffic statistics of late years show a growth of business in agricultural products, while the movement of mineral, forest and manufacturing products have remained stationary or even declined. The apparent anomaly may have two explanations: first, that since the commercial disasters of 1873, there has been a less rapid growth of towns, and but little interruption to the growth of the country; and second, that the town population is largely engaged in those small industries which do little to increase the products transported by public conveyances, though a vast deal to increase the average comfort of the population. For instance, a farming population in a new country, practicing a severe economy, supports few tailors, dress-makers, carpenters, masons, painters, dentists, teachers, carriage-makers, upholsterers, and the like. Having reached comparative affluence, this same population will require for its service a considerable number of people of these occupations. But they do not largely increase the traffic of the country. They travel and require importations for their supply, but they produce very little for export. A new farm opened may give eight or ten car-loads of freight exports yearly; a new dentist or bricklayer does not export a pound. Their products are for home consumption, and require little or no transportation. So from the time a new country is purely agricultural until it begins to manufacture for export, though the growth of population may be chiefly non-agricultural, the growth in traffic is likely to be still chiefly in agricultural products. In a state with the great mining, forest and manufacturing industries of Michigan even, we see from the just published report of Railroad Commissioner Williams for 1877 that the proportion of freights supplied from agriculture has increased regularly from 1873 to 1877, being 27.49 per cent. of the

whole freight in the former year and 36.22 in the latter. If the proportions were of tonnage mileage instead of tons moved, they would be much greater, as the average length of haul of agricultural products is much greater than that of any other large item of freight in the state, except merchandise.

And this is quite generally true in this country. Grain, cotton and cattle and meats are carried immense distances; coal and ores and the chief building materials usually not nearly so far. So the growth of agriculture remains to the railroads at large a matter of prime interest. It is, indeed, in the present circumstances of the country, a key to all other business when it is in a natural condition. For, with the exception of petroleum, agricultural products are our only important exports, the only products which may be increased indefinitely with the hope of finding a market.

It is for this reason that we give considerable attention to statistics of such production, as the best clue to the growth and tendency of traffic. The time has now come when the figures for the crop year are returned for grain, which it is always desirable to report in addition to those of the calendar year. The latter divides almost in the middle the movement of the crop of small grains, though it serves very well for corn, but from its returns we cannot gain the slightest idea of the fluctuations in the crops of wheat, oats, etc.

Below are given the receipts of flour (in barrels) and of each kind of grain (in bushels) at the eight Northwestern markets St. Louis, Peoria, Chicago, Milwaukee, Duluth, Detroit, Toledo and Cleveland for the five last crop-years ending with July. In the final totals flour has been reduced to grain at the conventional rate of five bushels to the barrel.

Receipts of Grain at Northwestern Markets for the Crop-Years beginning with August, for five years.

	1877-78.	1876-77.	1875-76.	1874-75.	1873-74.
Flour	5,949,054	4,892,534	5,343,609	5,327,843	6,309,895
Wheat	77,492,228	39,684,510	68,287,292	65,820,727	82,947,396
Corn	87,603,769	81,646,506	62,903,020	46,966,218	62,818,017
Oats	26,972,598	21,091,654	28,489,340	22,591,127	25,836,164
Barley	9,409,741	8,492,032	7,657,037	5,472,498	7,007,673
Rye	4,036,126	2,897,878	2,227,166	1,227,649	1,761,216
Total	205,514,402	154,412,580	167,563,765	143,078,219	180,370,466

Flour to bush. 29,745,270 24,462,670 26,718,345 20,639,215 31,549,475

Total bush. 235,259,732 178,875,250 194,282,110 169,717,434 211,819,941

The crop of 1873, marketed in 1873-74, was an entirely phenomenal one, never equaled in quantity, and forwarded most freely under the stimulus of high prices in a year of great financial distress, when money was badly needed everywhere. We feel that the influence of this magnificent harvest and the high prices received for it in mitigating the effects of the financial crisis of 1873 have never been sufficiently appreciated. It was especially great good fortune for the Northwest, which by it was let down easily, as it were, from the period of inflation. We may see this sufficiently from the statistics of cereal exports, which for the fiscal years ending with June were, for five years ending with this one of extraordinary grain production and prices and exceptional financial disaster, as follows:

Year.	Bushels.	Value.
1869-70.....	56,610,750	\$70,997,846
1870-71.....	63,819,573	78,009,953
1871-72.....	75,899,033	83,006,974
1872-73.....	93,968,932	97,232,877
1873-74.....	130,493,088	159,530,078

Thus for the last year the quantity exported was 38.3, and the value no less than 64 per cent. greater than in any previous year. An addition of \$62,000,000 to the receipts from cereal exports was a material help to the country in its necessities, and this was only a part of the increased receipts of the Northwest from its grain crop.

But the exceptional amount of the crop of 1873 must be borne in mind in the comparisons with succeeding years. Thus from the first of the tables above it appears that the Northwestern receipts for the three succeeding years were much below those of 1873. That of 1875 was called an excellent crop, and the average of the four years ending with 1876 was about 192,000,000 bushels a year, which is probably a liberal allowance for an average crop. Now, the crop of 1877 is seen to have exceeded this assumed average by 43,260,000 bushels, or 22½ per cent. As there had not been meanwhile any exceptional increase in the agricultural population, such as sometimes occurs by immigration to new country, and such as seems to have actually taken place this year (to be felt first in the crop of 1879), this crop of 1877 appears also to have been a phenomenal one, as much so as that of 1873, though, owing to the lower prices, not so remunerative to the farmers. The receipts reported from the crops of that year were 11 per cent. greater than those of 1873, 89 per cent. greater than those of 1874, 21 per cent. greater than those of 1875, and 31½ per cent. greater than those of 1876, the preceding year.

If we consider the small grains alone, as showing the

fluctuations of the summer harvests, we will have (subtracting corn from the totals above):

1877-78.	1876-77.	1875-76.	1874-75.	1873-74.
147,650,000	97,200,000	131,400,000	122,750,000	149,000,000

Thus though the receipts of small grains from the crop of 1877 were more than 50 per cent. greater than those of 1876, they were still a little less than those of 1873, which thus still remains unique for the productiveness of its summer harvest.

Wheat is the grain which varies most in productiveness, being liable to many accidents, and also more or less a favorite with farmers according to circumstances. For instance, the European war and the profitability of the crop of 1877 encouraged the sowing of a greatly increased area in 1878. Corn, on the other hand, is less liable to accident and is more of a staple; and the movement of it to market is a mere fraction of the whole crop. Moreover, there is a decided tendency to an increase in the exports from year to year, the European demand for food for horses being comparatively recent and growing rapidly.

The wheat receipts last year, we see, were 6½ per cent. less than those of 1873, but the corn receipts were about 40 per cent. greater. But the wheat receipts of 1877 were nearly twice as great as those of 1876; and those who speak of the bad crops of parts of Iowa and Minnesota as likely to put the Northwestern railroads to a test severer than they have ever had to endure heretofore have very short memories. In all Wisconsin and Minnesota nearly, the crop in 1876 was as bad as where it is worst now, while this year a much greater area was sown than in 1876. It seems from the latest reports that the Minnesota crop is likely to be less than last year, notwithstanding an increase of 30 per cent. in acreage; the good crops in the Red River valley and the fair crops in the southwestern part of the state are in districts where cultivation has but recently begun; while the great damage has been in that part of the state which is most fully occupied and which has by far the greatest area under cultivation. Smaller shipments of spring wheat from Minnesota, therefore, it is reasonable to expect, though greater than those of 1876-77. And most of the Minnesota roads will be adversely affected thereby, the chief exceptions being the Northern Pacific and the St. Paul & Pacific. The news from Wisconsin is not very definite, but a considerably smaller crop than last year is expected. In Iowa it remains doubtful whether the increased area will not make up for the damage in the northeastern part of the state, which is especially the wheat-growing part of it; but however this may be, the lines in Northern Iowa are likely to have a much smaller grain traffic than last year; the gains going to the roads further south, where the wheat crop is less important, but where there has been no serious injury to it this season, and a considerably increased area. Apparently most of the injury is on lines north of the Iowa Division of the Chicago & Northwestern.

After all, it still seems probable that the total wheat crop of the country is this year the largest on record. Winter wheat in Michigan, Ohio, Southern and Central Indiana and Illinois, and further south and east, seems to have been a magnificent crop. A single day's receipts at Toledo this week were about 400,000 bushels, mostly coming from the Wabash Railway, doubtless. Baltimore, too, is having the largest wheat receipts it has ever known. Losses to such roads as the Chicago, Milwaukee & St. Paul are likely to be more than made up by gains on the roads further south. And the fact that the heaviest crops are pretty well south of the lakes makes it probable that a larger share of this than of the last crop will go forward by rail. It must go out of its way to reach the lakes, and can be taken at a profit from most of the country through by rail at an expense no greater than that of carrying it northward by rail to the lakes, and then by water. The prospect is that a considerable number of roads which last year profited very little by the grain traffic this year will have an exceptionally heavy business. The Wabash Railway, and the vast system of roads south and east of it, seem to be best situated for carrying the great winter wheat crops; a few roads will carry it northward to Chicago, competing for the crop in Illinois and further west with the east-and-west roads, but we anticipate the coming year an unusually large proportion of through wheat shipments.

## THE CHICAGO &amp; NORTHWESTERN REPORT.

The fluctuations in the prosperity of this company are considerable from year to year, due chiefly to natural causes, but the last report records not only the most prosperous business of recent years, but a progress which may be counted on as assuring better average results in the future than in the past. It is really a "border" road, its Winona & St. Peter line having extended to and for some time actually beyond the limits of population and cultivation—so far beyond



that until recently trains were not run over the western 40 miles of the road, except occasionally. On its Iowa line also, though there are railroads and farms far to the west of it, for something like a hundred and fifty miles through an extremely fertile country only a comparatively small part of the land has ever been brought under the plow. Wilder still is the wilderness along perhaps another 150 miles of its lines in Northern Wisconsin and Michigan, but these are where ores and lumber were counted upon to support the road, and not agriculture, and where agriculture has never made much progress. But the lines in Iowa and Minnesota were built in the reasonable hope and expectation that the fertile lands alongside, much of which was owned by the companies building the roads, would be rapidly purchased and improved by immigrants. It seemed rational to suppose that a district in Iowa, fully as fertile as Illinois, and with even less uncultivable land, would, when afforded transportation, develop with something like the rapidity of Illinois after its first railroads were built, and soon afford a traffic similar in bulk to that which made some of the early Illinois railroads exceedingly prosperous. But though there was rapid growth for a time in Iowa and Minnesota, the rate of progress was soon greatly reduced. In the first place, before 1873 there was a great diversion of industry to occupations which then promised to be more profitable and pleasant than pioneering on the Western prairies: in the next place, it was not one or two or three railroads which were bringing new territory into market and making it accessible, but scores of them, so that all at once, we may say, all the desirable unsettled land in the country was offered to the intending emigrant; and while if it had been simply a question of Iowa and Minnesota the growth would probably have been all that could have been expected; when it came to Iowa, Minnesota, Dakota, Nebraska, Kansas, Colorado, Texas and California, even a heavy immigration and a general adherence to agriculture could not effect more than a moderate growth for the aggregate of the new country.

Moreover, circumstances for several years caused immigrants to pass over the lands next adjoining the well-settled districts—that is, the lands in Western Iowa and Minnesota—and prefer Kansas and Nebraska, which for several years grew much faster than the country next east of them, which was just about as little cultivated.

So for several years until last year the growth of population and production on the vast unbroken prairies along the western lines of the Chicago & Northwestern had been quite moderate, and the traffic not a quarter of what the country is capable of supplying. This has been shown very clearly by the reports of earnings from year to year on the different lines of this company, several of which have not nearly met the interest on their bonds, and some not their working expenses, while the progress made has been very slow indeed. For instance, the gross earnings of the Winona & St. Peter Railroad have been as follows for six years, which is the whole period that it has been completed:

Year ending with May	Earnings	Year ending with May	Earnings
1873	\$723,616	1876	\$631,153
1874	794,820	1877	577,270
1875	562,503	1878	795,004

There was an exceptionally heavy crop in 1873, as there was in 1877, and the earnings for the years in which these crops were carried were very nearly the same. This does not show that there has been no increase in the area cultivated and in the traffic carried, for everywhere there has been a material reduction in the rates received for transportation. But allowing for this, the progress made has not been such as was naturally to be expected. The earnings in these most favorable years have been only at the rate of \$2,400 per mile, and that in a country easily capable of yielding \$8,000 to \$10,000, and which will certainly some day yield so much, if railroads shall not be too much multiplied there, and will produce greater net earnings than the gross earnings have ever been hitherto.

The Iowa line (which is not owned but leased) is a different kind of property, having a considerable through traffic, including this company's share of the Pacific railroad traffic, which is remunerative, and something from the Sioux City & Pacific, the Dakota Southern and roads in Northern Nebraska. The eastern half of it is in a well peopled and cultivated country, and it is only on the western half that a great and rapid growth was to be expected. And here, though the progress has not been such as was to be expected, it has still been considerable, though probably partly owing to the growth in Pacific and other through traffic. We say the progress on the western half of the Iowa line, but this

is not quite accurate, for the information of the earnings is from the rentals paid to the two companies which own different parts of the line, the Chicago, Iowa & Nebraska, the 82.4 miles from the Mississippi to Cedar Rapids, which is one of the most productive lines worked by the company (earning \$17,655 per mile last year); and the Cedar Rapids & Missouri River Company, which owns the 271.6 miles from Cedar Rapids to Council Bluffs, besides a short branch from Clinton to Lyons. It is only on the western half or two-thirds of the latter road where most of the land is still uncultivated. Calculating from the yearly rentals the gross earnings of these two sections of the line across Iowa, we find them to have been as follows for the past five years:

Year	Chicago, Iowa & Nebraska	Cedar Rapids & Mo. River
1873-74	\$1,239,073	\$1,758,510
1874-75	1,327,200	1,775,787
1875-76	1,389,579	1,942,417
1876-77	1,257,240	1,942,096
1877-78	1,454,765	2,109,650

The first-named road is doing very well, and of course profits by any growth of traffic in the country west of it. The second line, which is more than three times as long, has usually earned per mile not one-half as much as the first-named, though probably the country on it is capable of producing, and will some day produce, as much per square mile as that on the eastern section, while its traffic is not competed for by rival roads, and there is a great net-work of them in Eastern Iowa.

On this western section the earnings, we see, increased less than 11 per cent. from 1873-74 to 1876-77; but a much more rapid progress is shown last year, amounting to nearly 9 per cent. in the single year. The railroad land on this line is not owned by the Chicago & Northwestern, but by a corporation succeeding the company which built the road, and it seems to have been less successful in disposing of its lands than the owners of land grants in Southern Iowa, Nebraska, and Kansas, and this year than those in Minnesota. Last year, however, it built a branch road 60 miles long to make its lands more marketable; and in the general tide of immigration westward this country is sure to share. Growth of traffic here, however, is not so important to the Northwestern Company as on the Winona & St. Peter, as the rental absorbs a considerable portion of the profits. Last year this rental amounted to about 31 per cent. of the receipts. From any additions to the present gross earnings, however, the lessee only has to pay 20 per cent.

The most encouraging feature of the last year's history has been the very rapid growth of population on the Winona & St. Peter line. The company's sales of its lands on this line last year were *thirty-six times* as great as those for the previous year; but its own sales are chiefly significant as indicating the general occupation of the alternate sections of government lands, which settlers can obtain free. Thus no considerable demand for the company's lands could be expected until the desirable government lands were pretty much all occupied, and, in fact, the company's land agent reports that nearly all of the lands on the line of this road have been pre-empted, or taken up by actual settlers. As the company's alternate sections in Minnesota and Dakota amount to 1,158,900 acres, this indicates an extraordinary immigration and the assurance of a much more considerable traffic on this road than it has had heretofore—a traffic which will in large part pass over 400 to 600 miles of the companies' roads in Dakota, Minnesota, Wisconsin and Illinois.

As the extraordinary spring wheat crop of 1877 was greatly to the advantage of this road, so doubtless will be the great damage to this crop in Minnesota, and the less damage on the Iowa line of this road, be materially to its disadvantage. But though wheat is the chief traffic of the Chicago & Northwestern's system, it must be remembered that it is by no means exclusively a wheat road. The 490 miles from Chicago to Omaha is in a country where wheat is a subordinate crop, and corn, hogs and other stock are the leading staples. And there are some 300 or 400 miles of other lines in Illinois and Iowa of which the same is true. A large part of the Wisconsin lines is where the wheat crop is little damaged, and some 200 miles in Wisconsin and Michigan scarcely carry grain at all, but are supported by ore and lumber traffic.

The line across Wisconsin will suffer materially by a reduction of shipments from Minnesota, and there can be no question that the prospect a month ago, that this company and the Chicago, Milwaukee & St. Paul would have by far the heaviest traffic in their history, has come to naught. But there is this encouraging feature. The disaster to the wheat crop is not so severe nor so widespread as that of 1876, when the crop was a total failure nearly all over

Wisconsin as well as in Minnesota, while in the latter state the area sown was 30 per cent. greater this year than last. Then the surplus of net earnings over fixed charges amounted to about 5 per cent. on the preferred stock.

The great difference between the crop of 1877 and that of 1876 is shown by the reports of traffic. The increase in tonnage mileage was no less than 28½ per cent., and that, it must be remembered, in a year when there had been very little increase of cultivation by immigration, such as there has been this year, and will be still more extensively next year. The contrast, it is true, is between the worst of years and almost the best of years.

Another notable fact is that this great increase in traffic was taken at a comparatively trifling increase in working expenses—only 1¼ per cent. When receipts are falling off, great economy (or reduction without economy) of expenses is sometimes forced. But in this case the receipts were growing rapidly. And the detailed statement of renewals shows that the road was liberally maintained. The percentage of working expenses and taxes to receipts for the whole system of roads (including some lines of very thin traffic) was but 51½ per cent., and, counting the proportion of expense the same for passenger and freight receipts, freight was carried at an average expense of 0.877 cent per mile, against 1.073 cents the previous year—a reduction of nearly one-fifth. It usually costs less per ton to carry a large than a small traffic over the same road, but it is certainly quite a feat to carry more than a quarter more traffic with substantially no increase in the cost. An increase of 11½ per cent. in the average freight-train load doubtless had much to do with the greater economy. Maintenance expenses on the Chicago & Northwestern proper were, in the aggregate, almost exactly the same as the year before. The fuel for the much heavier traffic, and even 7 per cent. greater train mileage, cost but 2½ per cent. more. The expense for employes' wages was less than 1 per cent. greater. The problem which the company's officers seem to have solved was the doing of a much greater work with the same force, or, at least, the same money. And if we mean men by force, then the expression is precisely correct. In this report, for the first time, is a table of the employes in each department each month—a table interesting and valuable for many purposes. It shows an average of 3.95 persons to have been employed per mile of road in 1876-77, and also in 1877-78—in the latter year an average number of 8,044½ persons for the whole year, whose average monthly wages, by the way, were \$47.27.

Although there have been considerable fluctuations in the gross earnings of this railroad, there has been a general movement to an increase in its profits of late years which had no great reverse, not even after the disastrous crop of 1876. Below we give the gross earnings, working expenses and net earnings of the whole system of roads, for the past six years:

Year	Gross earnings	Expenses	Net earnings
1872-73	\$13,775,555	\$8,927,080	\$4,848,475
1873-74	15,931,937	10,199,742	5,732,195
1874-75	13,786,304	8,781,270	5,005,034
1875-76	14,013,732	8,274,290	5,739,442
1876-77	13,033,102	7,526,101	5,507,001
1877-78	14,751,062	7,620,846	7,130,216

In these six years the mileage worked by the company has been increased from 1,850 to 2,078, and in the last five years there has been an increase of about \$600,000 in interest and rentals.

The natural growth of the Winona & St. Peter's traffic is likely in a short time to wipe out the loss on the proprietary roads, which even last year was \$680,000. Not much is to be hoped from the other two probably, which are in comparatively old and well-settled countries, and badly elbowed by competing lines. But with the Winona & St. Peter only tolerably developed, its loss can be turned into a considerable positive gain, and its traffic will add about as much to the profit of the lines east of the Mississippi as to that of the Winona & St. Peter itself.

#### Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

**New York Elevated.**—This company's *East Side Line* in New York is completed from the Battery to Fifty-ninth street and the Grand Central Depot, 5 miles.

**Illinois & St. Louis.**—Extended through East St. Louis, Ill., to a connection with the Illinois & St. Louis Bridge track, 1 mile.

This is a total of 6 miles of new railroad, making 947 miles completed in the United States in 1878, against 842 miles reported for the corresponding period in 1877, 1,142 in 1876, 594 in 1875, 913 in 1874, 1,906 in 1873, and 3,372 in 1872.

**LAKE AND CANAL RATES** have again advanced. Lake rates remained until Tuesday of this week at the rates announced last week, that is, 2 cents for corn and 2½ for



wheat from Chicago to Buffalo. But Tuesday  $2\frac{1}{4}$  for corn and  $2\frac{3}{4}$  for wheat were reported, and at Milwaukee (where, however, there are light shipments), 3 cents was given as the rate and freights were said to be "excited." Canal rates for most of the week have stood at 5 cents for wheat,  $4\frac{1}{2}$  for corn and 3 cents for oats from Buffalo to New York, closing "strong" on Tuesday and about  $\frac{1}{2}$  cent higher on Wednesday. These still, it must be remembered, are extremely low rates—about  $8\frac{1}{4}$  cents from Chicago to New York for wheat—but still better than the rate of  $6\frac{1}{4}$  cents that prevailed for some six weeks in June and July. The rates seem to be following closely their course last year, though later and at a considerable distance. At this time last year  $3\frac{1}{2}$  cents for corn and  $3\frac{3}{4}$  to 4 for wheat by lake, and  $6\frac{1}{4}$  for corn and  $6\frac{3}{4}$  for wheat by canal were the prevailing rates. This advance in water rates enables the railroads to get better rates and yet secure a large traffic. We understand, however, that the grain rate of Aug. 5 (25 cents per 100 lbs. from Chicago) is not actually obtained on most of the Northwestern shipments, where the lake competition is severest, but 20 cents is generally the actual ruling rate, which, however insufficient, is still much better than the 16 cent rate (or less) obtained in July and earlier.

ENGLISH FREIGHT RATES may be indicated by a few rates on hardware from Wolverhampton recently announced as reduced rates. These are equivalent to  $83\frac{1}{2}$  cents per 100 lbs. to London, at shipper's risk, collected and delivered by the railroad company, and 20 cents to Liverpool, collected but not delivered by the railroad company. The distance to London is about 125 miles; to Liverpool, 75 miles. At these rates the charge from New York to Chicago would be about \$2.50 per 100 lbs., except that no allowance is made for the hauling of freight to the station at Wolverhampton, which makes an important difference, and, of course, the short English haul is proportionately more expensive than the long American one. But it may be said that the current rates on hardware from Wolverhampton to London (125), together with the collection and delivery of the freight at the two termini, is two-thirds more than the current rate on grain from Chicago to New York, 960 miles, without collection or delivery.

JULY EARNINGS, so far as reported, are unexpectedly favorable. Of seventeen roads that have reported so far, sixteen earned more in 1878 than in 1877. The more northerly lines in the West were busy carrying the remainder of last year's wheat crop, and the more southerly lines have had their full quota of corn to carry, and besides an exceptional traffic in winter wheat. Since July, however, traffic generally seems to have improved except in the extreme Northwest—say northwest of Chicago.

THE LONG BRANCH CONFERENCE was devoted to the consideration of live-stock traffic, but the business was not finished, and is to come up again (and probably be disposed of) at a meeting of presidents in Saratoga on the 20th (next Tuesday), when, too, there is expected to be some discussion of the policy of abolishing or further restricting the payment of commissions on sales of passenger tickets.

## Contributions.

### Another Graphic Solution of the Train Problem.

COVINGTON, Virginia, July 22, 1878.

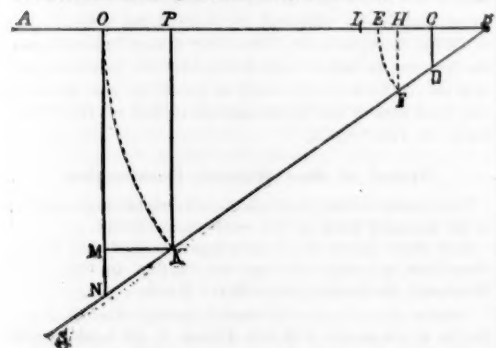
TO THE EDITOR OF THE RAILROAD GAZETTE:

Having been absent from home some weeks, I have not seen, until recently, the graphical solution of the problem of the trains by Mr. Vose, which appeared in the *Gazette* of June 28.

I confess I am unable to comprehend the graphical solution given in that number. The correctness of Mr. Vose's solution is not demonstrated.

Every algebraic solution of a problem having an arithmetical or geometrical signification can be represented graphically. When the problem is simple, the graphical solution is also simple and admits of an easy demonstration; when complicated, the graphical solution is also complicated, and its demonstration generally elaborate.

This problem is of the simpler kind, and will, I believe, be readily understood by the following construction:



Draw the indefinite line,  $AB$ . On this line lay off on any scale the distance  $BC = m$ , the speed in miles per hour of the freight train. At  $C$  erect a perpendicular, and from  $B$  as a centre, with a radius equal to the speed, in miles, of the mail per hour, taken from the same scale; describe an arc cutting the perpendicular in  $D$ . Join the points  $B$  and  $D$ , and through them draw the indefinite line  $BDS$ . Then  $BD$  and  $BC$  will represent the relative speed of the trains,  $BD$  representing the mail  $= n$ , and  $BC$  representing the freight  $= m$ .  $CD$  may be taken to represent one hour (I may re-

mark here that it is not necessary that  $CD$  should be drawn perpendicular to  $AB$ . I have drawn it thus because it is perhaps more convenient. The properties and relations of the problem will hold good, no matter what angle is included between the lines  $BC$  and  $BD$ , provided always that their ratio is that of  $m$  to  $n$ . Now lay off  $BE$  from the same scale as the former, and make it equal to the distance from the point of collision  $E$  to the end of the road  $B$ . From  $B$  as a centre, with a radius equal to  $BE$ , describe an arc cutting the indefinite line  $BDS$  in  $F$ ; draw  $FH$  perpendicular to  $AB$ . Now  $BF = BE$  has the same ratio to  $BH$  that  $BD$  has to  $BC$ , and this is the same as the ratio of  $n$  to  $m$ . It is evident from this that if the speed of the freight train had not diminished it would have reached the point  $H$  when the mail had reached the point  $E$ . Make now  $EL = EH$ , and lay off on the indefinite line  $AB$  the distance  $BO = 3$  times  $BL$ .  $BO$  is the total length of the road, and  $O$  is the starting point of the trains. Again, from  $B$  as a centre, with a radius equal to  $BO$ , describe an arc cutting the indefinite line  $BDS$  in  $K$ . Draw the perpendiculars  $ON$  and  $MK$ , to  $AB$  and  $ON$  respectively, and draw also the perpendicular  $KP$ .  $MN$  measured on the scale, where  $CD$  is taken to represent one hour, will represent the difference in time of starting of the trains.  $ON$  measured on the same scale would represent the entire time which the freight would have taken if its speed were constant to reach the end of the road, and  $PK$  on the same scale the time of the mail, if no collision occurred.  $OP$  on the scale of miles would represent the distance the freight was ahead before the mail started.

As  $OL = \frac{1}{2}$  of  $OB$  and  $LE = EH$ , we have  $LE = \frac{1}{4}$  of  $OB$ . It has been shown that with the relative speed of the trains remaining constant, the freight would have reached  $H$  at the time the mail reached  $E$ ; but as its speed was diminished one-half after passing the point  $L$ , it reached the point  $E$  with this diminished speed at the same time that it would have reached the point  $H$  had no change occurred in the speed.

D. SHANAHAN.

### Running the Fast Train.

The train leaving this city at 7:35 in the morning for New York, over the Pennsylvania Railroad, is among the fastest in the world. Indeed, a portion of the distance is made at a rate scarcely obtained by any other road in Europe or America. The distance between West Philadelphia and Jersey City is 89 miles, accomplished in one hour and 54 minutes, with a single stop, while the return is six minutes less, including two stops. This gives a rate, in going, of nearly 50 miles, and in returning of slightly more than 50 miles an hour, surpassing that of the celebrated Queen's mail between London and Holyhead, where the run of 264 miles occupies seven hours. At half past seven o'clock Friday morning, when a *Times* man, by permission, boarded the engine at the West Philadelphia depot the steam gauge marked 120 pounds and "still rising." Precisely five minutes later the bell clinked over the engineer's head, and almost simultaneously he gave a slight clutch of the lever and the train of four cars was off. It stopped at Germantown Junction 13 minutes later. As soon as the engine got clear of the suburbs she shrieked and bounded away at greater speed. About 20 minutes after it wound its way through Bristol, and in still less time the iron bridge over the Delaware was sighted and Trenton was bisected at the same moderate speed which had been adhered to through Philadelphia. But it was necessary to do better in order to reach Jersey City, nearly 60 miles away, at the appointed minute. Trenton was scarcely passed when the engineer touched up his steel. Between the first two mile posts noted, the distance was passed in 63 seconds; the next in a little less and a third in precisely 60. Hurrah! The train was spinning along at the rate of a mile a minute. And yet everything proceeded with so much smoothness that it was impossible to appreciate the amazing swiftness. There was no unusual jolting and in the cars passengers were smoking, dozing or reading, just as though it was an ordinary train in which they were riding. Just beyond Princeton the speed rose to a rate of a mile in 58 seconds and continued it without diminution, except a slight "slowing up" at Monmouth Junction, until New Brunswick was in view. As soon as the town was left behind the engine was at it again, and in the neighborhood of Menlo Park the speed became prodigious, as if the locomotive was snorting defiance to the wonderful Edison in his laboratory under the hill.

In this neighborhood Conductor Silance, with watch in hand, carefully timed the train for three miles. The first was passed in 54 seconds, the second in 52 and the third in 50. The last was 72 miles an hour. The puffs from the engine had become a continuous shuddering roar; the driving wheels were spinning around 400 times a minute—a half dozen times a second—with a centrifugal force that would seem, ought to shatter their whizzing peripheries to atoms. The day was a hot one and the air was at a dead calm, but it rushed through the narrow door in front of the engine like a tornado. Small bridges were thundered over so quickly that they gave a single rumble as they whisked out of sight behind; the express train coming from the opposite direction flashed by like a meteor in a single hot puff of air; you might yell to the engineer, two feet distant, and yet he would only see your lips move, without hearing anything above the deafening roar of the engine, which drowns everything, excepting the shriek of the whistle. All the time the fireman steadily shovels in coal or climbs around the engine with oil can in hand, his clothing fluttering so fiercely in the wind that it seems in danger of being blown off. The engineer with his hand upon the lever, watches with a cat-like vigilance, the rails sweeping under his wheels. The whole train is constantly under his eye, and he never allows his attention to be diverted for an instant.

One Saturday morning, as the train was approaching New Brunswick, and before its speed had diminished, Ed. Osmond, the engineer, felt a sudden thump beneath him. It was repeated instantly and then his entire side of the cab flew off as if from a thunderbolt. But the veteran knew like a flash what was coming when he heard the first thump, and with one bound he threw himself aside the boiler, shut off steam and applied the automatic air-brake. This stopped the train with such suddenness as almost to throw the passengers off their seats; but no one was hurt, and the slight scratch of the engineer's nose and the blow upon his arm did not prevent his running back to Philadelphia in the evening. This is the only accident which the fast train has encountered since it began running on the 8th of July last. As proof of the ease with which the extraordinary speed is maintained, it may be said that the train goes into the Jersey City depot frequently ahead of its schedule time. On Friday the passengers began stepping off just a minute and a half before the

train was due. Of the 20 trips from West Philadelphia to New York, 25 were made on time connection. The train boat has been missed only twice. Once was on account of the accident mentioned and the other was a twelve-minute detention caused by an excursion train getting in the way. The other delays were just two minutes apiece, occasioned by the draw in the river. The return trip fails oftener, it being difficult to get away from Jersey City at the exact moment, while the run is harder, including more up grade.

The train generally consists of four or five cars, including a palace one, and averages about 300 passengers a day. It is under the charge of Louis Silance, an experienced conductor, while the two engines, which alternately do the work, are run by the veterans Edward Osmond, who has been on the road 21 years and has handled a locomotive 16 years, and Frank Peacock, equally skilled and careful. The register shows that many a mile has been made in 48 seconds, which is at the rate of 75 miles an hour. Going eastward the train makes one and in returning two stops. The driving wheels of the engines are only five feet in diameter, but during the present week this will probably be increased to five and a half feet.—*Philadelphia Times*.

## General Railroad News.

### MEETINGS AND ANNOUNCEMENTS.

#### Railroad Conventions.

The *Traveling Passenger and Advertising Agents' Association* will hold its sixth annual convention at the Gibson House, Cincinnati, beginning Sept. 4, at noon.

The *General Ticket and Passenger Agents' Association* will hold its regular semi-annual meeting in Chicago, Sept. 13.

The *General Time Convention* will hold its fall session at the Grand Pacific Hotel, Chicago, Oct. 10.

The *Railroad Claim Agents' Association* will meet at the Planters' Hotel, St. Louis, Oct. 15.

The *Southern Time Convention* will hold its fall session at the Windsor Hotel, New York City, Oct. 17.

#### Foreclosure Sales.

The *Leavenworth, Lawrence & Galveston* road was sold in Topeka, Kan., Aug. 9, under a decree of foreclosure, and bought by Charles Merriam and others for account of the bondholders, the price paid being \$760,000. The road extends from Lawrence, Kan., to Coffeyville, 144 miles, with a branch of 2 miles to Parker. The funded debt consists of \$5,000,000 first-mortgage bonds and about \$4,000,000 unpaid coupons. The bonds are held chiefly in Boston and its neighborhood.

The *Selma & Gulf* road will be sold at Selma, Ala., Sept. 16, under an order of the Alabama Court of Chancery.

### ELECTIONS AND APPOINTMENTS.

*Altoona Coal & Iron Co.*—The officers of this company, which is building a short road in Pulaski County, Va., are: President, George W. Palmer; Secretary, Robert M. Patterson; Treasurer, Charles W. Palmer; General Superintendent, Wm. T. Hart.

*Atlanta & Charlotte Air Line.*—Mr. H. M. Cottingham having resigned the office of General Freight Agent of this company, to take effect Aug. 1, all correspondence relating to that department should, until further notice, be addressed to G. J. Foreacre, General Manager, at Atlanta, Ga.

*Atlantic & St. Lawrence.*—At the annual meeting in Portland, Me., Aug. 6, the following directors were chosen: John B. Brown, Charles E. Barrett, H. J. Libby, S. E. Spring, J. Hickson, Sir A. T. Galt, F. R. Barrett, T. K. Swan, Philip H. Brown. The road is leased to the Grand Trunk.

*Baltimore & Cumberland Valley.*—At a meeting held in Waynesboro, Pa., Aug. 2, the following directors were chosen: George J. Balsey, Jacob S. Good, E. A. Herring, David Hoover, Simon Lecon, Joseph Price, J. N. Snively. The board elected Dr. E. A. Herring President; George J. Balsey, Secretary; Joseph Price, Treasurer.

*Baltimore & Ohio.*—Mr. Samuel Powell has been appointed General Agent in Chicago. Mr. Powell was until recently and for a great many years General Ticket Agent of the Chicago, Burlington & Quincy, and is and has been almost from its first organization Secretary of the General Ticket and Passenger Agents' Association.

*Buffalo & Southwestern.*—Mr. John A. Read has been appointed Auditor. Mr. Wm. Craig has been appointed Cashier, in place of J. A. Campbell, resigned.

*Central of Iowa.*—At the annual meeting in Marshalltown, Ia., Aug. 5, the following directors were chosen: H. E. J. Boardman, Marshalltown Ia.; Wm. H. Severs, Oskaloosa, Ia.; Horace Abbott, John S. Gilman, Thomas H. Kensett, Baltimore; John J. Crane, H. C. Fahnestock, Isaac Hyde, Jr., George E. Taintor, New York; Isaac M. Cate, Boston.

*Central Pacific.*—The annual meetings of this company's controlled lines were held in San Francisco, July 31, with the following results: *Anador Branch.*—Leland Stanford, President; C. P. Huntington, Vice-President; E. W. Hopkins, Treasurer; D. D. Colton and Charles Crocker, Directors; J. O. B. Gunn, Secretary. *Berkeley Branch.*—Leland Stanford, President; C. P. Huntington, Vice-President; E. W. Hopkins, Treasurer; C. F. Crocker and D. D. Colton, Directors; J. O. B. Gunn, Secretary. *Los Angeles & San Diego.*—Leland Stanford, C. P. Huntington, Chas. Crocker, David D. Colton, N. T. Smith, Directors; Charles Crocker, President; David D. Colton, Vice-President; N. T. Smith, Treasurer; J. L. Willcutt, Secretary. *Market Street.*—Leland Stanford, Charles Crocker, C. P. Huntington, N. T. Smith, J. L. Willcutt, Directors; Leland Stanford, President; Charles Crocker, Vice-President; N. T. Smith, Treasurer; J. L. Willcutt, Secretary. *Mission Bay Bridge.*—Leland Stanford, Charles Crocker, N. T. Smith, C. P. Huntington, J. L. Willcutt, Directors; Leland Stanford, President; Charles Crocker, Vice-President; N. T. Smith, Treasurer; J. L. Willcutt, Secretary. *Northern.*—Leland Stanford, President; C. P. Huntington, Vice-President; E. W. Hopkins, Treasurer; Chas. F. Crocker and D. D. Colton, Directors; J. O. B. Gunn, Secretary. *Potrero & Bay View.*—Leland Stanford, Charles Crocker, N. T. Smith, Willard V. Huntington, J. L. Willcutt, Directors; Leland Stanford, President; Charles Crocker, Vice-President; N. T. Smith, Treasurer; J. L. Willcutt, Secretary. *Sacramento & Placerville.*—Leland Stanford, President; C. P. Huntington, Vice-President; E. W. Hopkins, Treasurer; C. F. Crocker and J. O. B. Gunn, Directors; J. O. B. Gunn, Secretary. *Stockton & Copperopolis.*—Leland Stanford, President; Charles F. Crocker, Vice-President; E. W. Hopkins, Treasurer; D. D. Colton and W. V. Huntington, Directors; J. O. B. Gunn,



Secretary. *Terminal*.—Leland Stanford, President; C. P. Huntington, Vice-President; E. W. Hopkins, Treasurer; Charles Crocker, E. H. Miller, Jr., W. E. Brown and R. Robinson, Directors; J. O. B. Gunn, Secretary.

*Chicago & Alton*.—Mr. Lem. Fowler has been appointed General Eastern Agent, with office in New York.

*Chicago, Burlington & Quincy*.—The following appointments in the office of General Auditor J. L. Lathrop are announced: Auditor of Expenditures, O. H. Smith; Auditor of Ticket and Passenger Accounts, John Dyer; Auditor of Freight Accounts, Wm. McCredie; Car Accountant, Eben Matthews.

All drafts for balances and dues to the company will be made by Amos T. Hall, Treasurer, and all drafts for balances due by the company should be drawn upon him.

Mr. James Wood has been appointed Assistant General Ticket and Passenger Agent. He recently held the same position on the Michigan Central.

*Cleveland & Mahoning Valley*.—At the annual meeting in Cleveland, O., Aug. 7, the following directors (one-third of the board) were chosen: Charles Pease, Cleveland, O.; H. E. Parsons, Ashtabula, O.; H. S. Hudekoper, Meadville, Pa. The board re-elected Reuben Hitchcock President; J. H. Devereux, Vice-President; E. E. Poppleton, Secretary; H. K. Spencer, Treasurer. The road is leased to the Atlantic & Great Western.

*Chicago, Milwaukee & St. Paul*.—Mr. A. Hoppe has been appointed Assistant General Passenger Agent.

*Chicago & Northwestern*.—Mr. Charles E. Simmons, of Chicago, has been appointed Land Commissioner, in place of G. B. Goodwin, deceased.

*Chicago & State Line*.—The officers of this company, organized by the purchasers of the Chicago & Southern road, are: President, Joseph Hickson; Vice-President, John Bell; Secretary and Treasurer, James Walsh; Directors, John Bell, J. J. Herrick, Joseph Hickson, J. H. Howe, James Walsh. Mr. Hickson is General Manager of the Grand Trunk.

*Dayton & Southeastern*.—Mr. John E. Gimperling has been appointed Receiver, on application of the trustees under the mortgage. Mr. Gimperling has been for some time General Passenger Agent, and was recently appointed Superintendent.

*Des Moines & Knoxville*.—The officers of this new company are: Vice-President, J. S. Clarkson; Secretary, J. S. Runnels; Treasurer, Wm. Christy.

*Indianapolis, La Porte & Michigan City*.—At the annual meeting in Michigan City, Ind., Aug. 6, the following directors were chosen: A. R. Colburn, Wm. Cutting, David Macy, V. T. Mallott, W. G. Peck, H. H. Roberts, W. H. Walker. The board re-elected David Macy, President; Wm. Cutting, Vice-President; L. G. Cannon, Secretary; V. T. Mallott, Treasurer. The road is leased to the Indianapolis, Peru & Chicago.

*Miami Valley*.—Mr. Roddy Evans has been appointed Superintendent. He was formerly connected with the Baltimore & Ohio.

*Minneapolis, St. Cloud & Sauk Rapids*.—The first board of directors of this new company is as follows: Charles A. Gilman, T. C. McClure, St. Cloud, Minn.; Samuel Whiting, Jr., Clearwater, Minn.; S. E. Adams, T. G. Mealey, Monticello, Minn.; W. H. Dunwoody, H. G. Harrison, Thomas Lowry, W. McNair, John Martin, E. H. Moulton, S. E. Neiler, Minneapolis, Minn.; Theodore B. Casey, Toledo, O.

*Missouri Pacific*.—Mr. R. R. Powell has been appointed Fuel and Tie Agent, in place of E. L. Wentz, resigned.

*New York, Lake Erie & Western*.—The following changes are announced: Mr. H. W. Fuller is appointed General Eastern Passenger Agent of the company, with office at New York, vice Mr. C. P. Craig, resigned. Mr. B. M. Arms continues as General Western Passenger Agent, with office at Chicago, representing the company in the Northwest as heretofore, and also in the Southwest, succeeding Mr. H. W. Fuller. Mr. John S. Bartlett is appointed Northern Passenger Agent, in charge of the Middle and Northern districts, with office at Buffalo.

*Pratt Coal & Coke Co.*—The officers of this company, which is building a short road in Alabama, are: H. F. DeBardelaben, President; J. W. Sloss, Secretary and Treasurer; T. H. Aldrich, Superintendent.

*Southeastern, of Canada*.—At the annual meeting in Montreal, last week, the following directors were chosen: Bradley Barlow, James O. Halloran, C. W. Foster, B. B. Smalley, Asa B. Foster, S. W. Foster, A. B. Chaffee, J. G. Richardson, E. L. Chandler, Nathaniel Pettis. The board elected Bradley Barlow President; James O. Halloran, Vice-President; A. B. Chaffee, Secretary and Treasurer; A. B. Foster, General Manager; C. W. Foster, General Superintendent. Mr. Barlow is a director of the Central Vermont.

*Vaca Valley & Clear Lake*.—Mr. Lloyd Tevis, of San Francisco, trustee under the mortgage, has been appointed Receiver of this California road.

*Wisconsin Central*.—Mr. E. Bacon having resigned the position of Superintendent, Mr. Charles F. Dutton is appointed Superintendent of the Milwaukee and Eastern divisions, with headquarters at Milwaukee, Wis. Mr. G. Campbell (in addition to his position as Master Mechanic) is appointed Superintendent of the Southern, Middle and Northern divisions, with headquarters at Stevens Point, Wis.

## PERSONAL.

—Hon. Wm. H. Y. Hackett, a prominent and wealthy lawyer, died at his residence in Portsmouth, N. H., Aug. 9, aged 78 years. He was for a number of years a director and clerk of the Portsmouth, Great Falls & Conway, and the Eastern in New Hampshire, and was connected with some other local companies.

—Hon. Alexander Mitchell, President of the Chicago, Milwaukee & St. Paul Company, and also President of the Wisconsin Marine and Fire Insurance Company Bank at Milwaukee, was chosen President of the Bankers' National Association at the annual convention in Saratoga last week.

—Mr. H. M. Cottingham has resigned his position as General Freight Agent of the Atlanta & Charlotte Air Line.

—It is said that Mr. Robert Harris, late President of the Chicago, Burlington & Quincy, and Mr. J. F. Tucker, Traffic Manager of the Illinois Central, have been asked to act as arbitrators between the Northern Pacific and the St. Paul & Pacific in the dispute as to the use by the former road of the St. Paul & Pacific track between Sauk Rapids and St. Paul.

—Mr. James G. French, a prominent citizen of Montpelier, Vt., died in that town Aug. 8. He was considerably interested in railroad property as contractor and owner. He built and for some time managed the Montpelier & Wells

River road, but it proved an unfortunate venture, and he was at last obliged to give it up to the bondholders. A few weeks since he closed a contract to build the Kalamazoo, Lowell & Northern Michigan road.

—Mr. Wm. F. Smith, for many years Master Car-Builder of the Cleveland, Columbus, Cincinnati & Indianapolis road, died in Columbus, O., Aug. 11. He was born in Dover, Mass., in 1826, and went to Cleveland in 1849. He was Master Car-Builder almost from the first construction of the road until a few months since, when he resigned on account of failing health. He also owned an interest in the Fulton Foundry, at Cleveland. He leaves two children, both grown up.

## TRAFFIC AND EARNINGS.

### Railroad Earnings.

Earnings for various periods are reported as follows:

Year ending May 31:

	1877-78.	1876-7.	Inc. or Dec.	P. c.
Texas & Pacific.....	\$2,331,310	\$2,043,453	I.	\$287,857 14.1
Expenses.....	1,448,439	1,352,446	I.	95,993 7.1
Net earnings.....	\$882,871	\$691,007	I.	\$191,864 27.8
Earn. per mile.....	5,251	4,927	I.	324 6.6
Per cent. of exps.....	62.16	66.18	D.	4.02 6.1

Year ending June 30:

Nash, Chattanooga, & St. Louis					
Louis .....	1,871,809	1,632,277	I.	239,532	14.7
Expenses .....	1,070,270	926,234	I.	144,036	15.6
Net earnings .....	\$801,539	\$706,043	I.	\$95,496	13.5
Earn. per mile .....	4,129	4,787	D.	658	15.7
Per cent. of exns. ....	57.00	56.62	I.	0.38	0.7

Northern Pacific (in Minnesota).....	685,799	629,293	I.	56,506	9.1
Expenses.....	328,467	336,340	D.	7,873	2.3
Net earnings.....	\$307,332	\$292,953	I.	\$74,379	25.4
Earn. per mile.....	2,739	2,478	I.	261	10.5
Per cent. of exps.....	46.82	53.47	D.	6.55	12.1

Seven months ending July 31:

	1878.	1877.			
Atchison, Topeka & Santa Fe.....	\$1,828,383	\$1,223,813	I.	\$604,570	49.4
Central Pacific.....	9,400,363	9,230,572	I.	169,791	1.8
Denver & Rio Grande.....	559,138	380,413	I.	178,725	47.0
Detroit & Milwaukee Grand Trunk.....	518,512	451,246	I.	67,266	14.9
Grand Trunk.....	5,068,975	5,140,456	D.	71,481	1.4
Gt. West. of Canada.....	2,613,052	2,381,101	I.	231,951	9.7
Ill. Central Ill. lines.....	2,912,389	2,556,123	I.	356,266	13.7
" Spring, R. & W. ....	111,427	.....	.....	.....	.....
" Iowa lines.....	854,825	692,086	I.	162,739	23.1
Ind., Bloom. & West St. L. Alt. & T. H. Belleville Line.....	702,904	664,122	I.	38,782	5.8
St. Louis, Iron Mt. & Southern.....	256,709	270,632	D.	13,923	5.1
St. Louis, Iron Mt. & Southern.....	2,159,466	2,209,461	D.	49,995	2.3
St. Louis & South-eastern.....	626,766	578,608	I.	48,088	8.3
Scioto Valley.....	145,890	.....	.....	.....	.....
Toledo, Peoria & Warsaw.....	705,016	572,862	I.	132,154	23.1

Six months ending June 30:

Six Months Ending Sept. 30.					
At. Miss. & Ohio.....	\$761,810	\$756,118	I.	\$5,692	0.8
Net earnings.....	188,288	178,098	I.	10,190	5.7
P. c. of expenses.....	75.27	76.38	D.	1.11	1.5
Clev. Mt. Vernon & Delaware.....	180,261	185,880	D.	5,619	3.0
Net earnings.....	30,230	32,012	D.	1,782	5.9
P. c. of expenses.....	85.57	82.72	I.	2.85	3.4
Dakota Southern.....	108,730	83,416	I.	25,314	24.2
Net earnings.....	47,450	.....	.....	.....	.....
P. c. of expenses.....	54.27	.....	.....	.....	.....
Gal., Har. & San Antonio.....	529,031	423,452	I.	105,581	24.9
Minneapolis & St. Louis.....	210,568	.....	.....	.....	.....
Net earnings.....	83,197	.....	.....	.....	.....
P. c. of expenses.....	60.51	.....	.....	.....	.....

Missouri, Kansas & Texas .....	1,255,760	1,430,933	D.	175,173	12.2
Net earnings .....	168,946	519,194	D.	350,248	67.5
P. c. of expenses .....	86.53	63.71	I.	22.82	35.8
Nash., Chat. & St. L. ....	821,073	810,994	I.	10,079	13.5
Net earnings .....	274,705	312,926	D.	38,161	12.2
P. c. of expenses .....	66.57	61.41	I.	5.16	8.4
Paducah & Memphis .....	100,397	86,310	I.	14,087	16.3
Net earnings .....	21,445	22,353	D.	908	4.1
Per cent. of exps. ....	78.94	74.37	I.	4.57	6.1
St. Louis, Iron Mt. & Southern .....	1,869,217	1,932,141	D.	62,924	3.3
Net earnings .....	665,120	801,452	D.	136,332	17.0
Per cent. of exps. ....	64.43	58.52	I.	5.91	10.1
St. Paul & Sioux City .....	285,113	207,740	I.	77,373	37.3
Net earnings .....	109,294	46,072	I.	63,222	137.1
Per cent. of exps. ....	61.60	77.72	D.	16.03	20.6
Sioux City & St. Paul .....	179,764	113,528	I.	66,236	58.4
Net earnings .....	48,450	11,050	I.	37,400	338.5
Per cent. of exps. ....	72.95	89.87	D.	16.92	18.8
Southern Minnesota .....	373,983	207,853	I.	166,130	79.9
Net earnings .....	214,186	44,621	I.	169,565	380.2
Per cent. of exps. ....	42.73	78.48	D.	35.75	45.6
Wabash .....	2,187,390	2,059,070	I.	128,320	6.2
Net earnings .....	513,153	428,113	I.	85,040	19.9
Per cent. of exps. ....	76.55	79.21	D.	2.66	3.4

Five months ending May 31:

First Month Ending Aug. 31.					
Grand Rapids & Indiana.....	\$478,010	\$430,883	I.	\$47,127	10.9
Net earnings.....	55,450	125,742	D.	70,293	55.9
Per cent. of exps.....	88.30	70.80	I.	17.50	24.7
Int. & Gt. Northern.....	508,937	586,451	D.	77,514	13.2
Net earnings.....	137,258	88,231	I.	49,027	55.9
Per cent. of exps.....	73.02	84.95	D.	11.93	14.0

Month of May:

Erie.....	\$1,172,961	\$1,234,095	D.	\$61,134	5.0
Net earnings.....	253,479	305,030	D.	51,551	10.9
Per cent. of exps.	78.39	75.29	I.	3.10	4.1

Month of June:

Gal., Harrisburg & San Antonio.....	\$85,058	\$53,121	I.	\$31,937	60
--	----------	----------	----	----------	----

Month of July:

Atchison, Topeka & Santa Fe.....	\$330,000	\$187,142	I.	\$142,858	76.4
Central Pacific.....	1,517,000	1,391,867	I.	125,133	9.0
Denver & Rio Grande.....	121,518	74,276	I.	47,242	63.6
Ill. Cen., Ill. lines.....	460,998	381,373	I.	79,625	20.8
" Spring Div. ....	23,106	.....	.....	.....	.....
" Iowa lines.....	106,059	92,713	I.	13,346	14.4
Ind., Bloom. & Western.....	88,597	84,726	I.	3,871	4.6
St. Louis, Alt. & T. H., Belleville Line	33,446	32,141	I.	1,305	4.1
St. Louis, Kan. City & Northern.....	237,829	193,924	I.	43,905	22.6
St. Louis & Southern.....	96,062	91,164	I.	4,898	5.4
Scioto Valley.....	28,176	.....	.....	.....	.....
Toledo, Peoria & Warsaw.....	91,974	74,359	I.	17,615	23.5

Week ending Aug 2:

18	Gt. Western, of Can.	\$82,973	\$87,710	D.	\$4,737	
	Week ending Aug 3:					

Week ending Aug 3:

	<b>Delaware Fruit Traffic.</b>	
	Peach shipments from Delaware and the Eastern Shore	

### Delaware Fruit Traffic.

Peach shipments from Delaware and the Eastern Shore

continue to be very small, hardly enough to keep a single peach train running. The returns from the business to the railroads this year will be very small. In a good year there is a considerable surplus of fruit which is sent to Western cities, but this year the traffic is reversed, and the Baltimore & Ohio is carrying peaches from Southern Ohio to Baltimore, four or five car-loads a day having been carried through this week.

### Coal Movement.

Coal tonnages for the seven months to the end of July are reported as follows, the tonnage in each case being only that originating on the line to which it is credited:

	1878.	1877.	Inc. or Dec.	P. c.
Philadelphia & Reading.....	2,479,751	3,517,824	D.	1,038,073 29.5
Northern Central, Shamokin Div., and Summit Br. R. R. ....	393,441	360,173	I.	33,268 9.2
Danville, Hazelton & Wilkesbarre.....	15,630	8,800	I.	6,830 76.4
Pennsylvania Canal.....	162,474	216,810	D.	54,336 25.1
Central of N. J., Lehigh Div. ....	1,157,205	1,729,059	D.	571,854 33.1
Lehigh Valley.....	1,788,500	2,285,093	D.	497,493 21.8
Penn. & New York.....	16,220	32,728	D.	16,508 50.5
Del., Lacka. & Western.....	1,125,396	1,306,199	D.	180,803 13.8
Del. & Hudson Canal Co. ....	1,132,929	1,283,899	D.	150,970 11.8
Pennsylvania Coal Co. ....	447,261	638,735	D.	191,474 39.0
State Line & Sullivan.....	18,679	5,775	I.	12,904 223.4

Total anthracite.....8,737,486 11,386,075 D. 2,648,589 23.3

Semi-bituminous:

	1878.	1877.	Inc. or Dec.	P. c.
Cumberland, all lines.....	804,169	739,842	I.	64,327 8.7
Huntingdon & Br'd Top.....	81,574	109,411	I.	27,837 34.0
East Broad Top.....	35,463	29,136	I.	6,327 21.7
Tyrone & Clearfield.....	741,200	764,343	D.	23,143 3.0
Bellefonte & Snow Shoe.....	14,032	23,687	D.	9,655 40.7

Total semi-bitu. ....1,676,438 1,631,877 I. 44,561 2.7

Bituminous:

	1878.	1877.	Inc. or Dec.	P. c.
Barclay.....	177,261	175,798	I.	1,463 0.8
Alleghy Region Pa. R.R. ....	115,844	109,411	I.	6,433 5.9
Penn. and Westmoreland gas coal.....	389,151	390,745	D.	1,594 0.7
West Pennsylvania R. R. ....	107,125	104,363	I.	2,762 2.7
Southwest Penn. R. R. ....	14,756	22,551	D.	7,795 34.5
Pitts'gh Region, Pa. R.R. ....	238,536	263,271	I.	24,735 17.3

Total bituminous.....



is extraordinary and unexampled for that city. It is remarkable that while the receipts of Baltimore have swelled so enormously within the past weeks those of Philadelphia, whose rail lines penetrate almost the same territory, and whose rates are but the least trifle higher than those to Baltimore, are considerably less than its average receipts for the year (for the 31 weeks ending Aug. 3 its average weekly receipts have been 705,810 bushels, while its average for the last two weeks has been but 615,000 bushels).

For the 31 weeks from Jan. 1 to Aug. 3, receipts and shipments are reported as follows, flour in barrels and grain in bushels:

Flour:	1878.	1877.	Increase.	P. c.
Northwestern receipts.	3,278,945	2,325,693	953,252	41.0
" shipments.	3,365,395	2,399,018	966,377	40.3
Atlantic receipts.	4,851,106	3,705,825	1,145,281	30.9
Wheat:				
Northwestern receipts.	35,995,451	11,086,058	24,909,393	224.7
" shipments.	26,078,451	10,650,614	15,427,837	145.6
Atlantic receipts.	43,647,442	6,601,859	37,045,583	561.3
Corn:				
Northwestern receipts.	55,020,562	45,108,540	9,912,022	22.0
" shipments.	47,925,731	38,854,735	9,070,996	23.4
Atlantic receipts.	68,222,004	48,035,897	20,186,107	42.0

All Grains:  
Northwestern receipts 11,414,640 70,885,925 40,528,715 57.1  
" shipments 87,333,058 60,692,553 26,640,505 43.9  
Atlantic receipts 128,806,885 67,068,417 61,738,468 92.1

—and for five years the movement of grain of all kinds has been for the seven months:

Northwestern Receipts:	1878.	1877.	1876.	1875.	1874.
11,414,640	70,885,925	99,507,509	74,423,302	102,307,378	
Northwestern Shipments:	1878.	1877.	1876.	1875.	1874.
87,333,058	60,692,553	81,314,078	59,020,039	77,508,329	
Atlantic Receipts:	1878.	1877.	1876.	1875.	1874.
128,806,885	67,068,417	94,289,285	66,244,536	84,590,165	

Thus it appears that the business of the seven months has not only been enormously greater than that of the corresponding period last year, but has been greater than in any year previous. The Northwestern receipts before this year were greatest in 1874, but this year they are 9 per cent. greater than in 1874; the Northwestern shipments previous to this year were greatest in 1876; but this year they have been greater by 7½ per cent. than in 1876. The Atlantic receipts before this year were greatest in 1876; but this year they have been no less than 36 per cent. greater than in 1876.

The number of bushels and the percentage of the total Northwestern shipments for the seven months that went forward by rail, were as follows:

1878.	1877.	1876.	1875.	1874.
43,040,940	23,773,761	49,125,278	30,805,178	35,183,791
49.3 p. c.	47.4 p. c.	60.4 p. c.	51.7 p. c.	45.4 p. c.

Of the total rail shipments nearly one-half were made this year in the 13 weeks before navigation opened, and but 53½ per cent. in the 18 weeks since navigation opened. That is, the average weekly rail shipments before navigation opened were 1,543,930 bushels; and since, 1,276,103 bushels; while the average weekly lake shipments since navigation has been open have been 2,460,673 bushels.

For July, the first month of the California crop year, wheat shipments from San Francisco were: 1878, 567,620 bushels; 1877, 260,690 bushels; increase, 306,930 bushels, or 117.7 per cent. All the shipments this year were to Great Britain.

For the week ending Aug. 12, the following reports are made:

Receipts and Shipments at Chicago and Milwaukee.		
	Receipts.	Shipments.
Chicago.	3,719,387	3,082,149
Milwaukee.	125,000	237,130

About two-thirds of the Chicago receipts and shipments were corn.

Buffalo Receipts and Shipments.		
	Receipts.	Shipments.
By rail.	887,400	1,633,841
By water.	2,487,831	1,215,458
Total.	3,375,231	2,849,299

The receipts at the four Atlantic ports were:

New York.	3,048,589	Philadelphia.	878,700
Baltimore.	1,083,153	Boston.	311,845

Of the New York receipts, 1,787,804 bushels, or 59 per cent., were by rail.

## THE SCRAP HEAP.

### Railroad Manufactures.

The Philadelphia & Reading Co.'s rolling mill at Reading, Pa., is running full double turn.

The Glendower Mills, at Danville, Pa., are busy on iron rails, turning out 300 tons a week.

The Rolling Mills Co., at Cape Elizabeth, Me., has added machinery for the manufacture of spikes to its works. The company has recently filled orders for rails for the Maine Central and Boston & Maine roads.

The Hinkley Locomotive Works, in Boston, have orders for 13 engines and have recently increased their working force.

Morgan, Williams & Co., at Alliance, O., have recently shipped a lot of steam hammers, shears and other machinery to the Rock Island Arsenal, the Cambria Iron Co., the Edgar Thomson Steel Works and other manufacturing concerns.

The Warren Foundry & Machine Co., at Phillipsburg, N. J., has secured a contract for water pipes for New York, which will keep the foundry running nearly a year.

The Baldwin Locomotive Works, at Philadelphia, have an additional order from the New York Elevated road. Orders are also on hand for the Long Island road, Morgan's Louisiana & Texas, the Utah & Northern and other roads, besides several for street car motors.

The Wabash Railway shops at Fort Wayne, Ind., are building a heavy passenger engine for the fast trains. It has 17 by 22 in. cylinders, steam ports 17 in. long; boiler 54 in. diameter with 175 flues 11 ft. long and a fire-box 6 ft. long. The driving wheels are 5 ft. 9 in. diameter and are 8 ft. 6 in. between centers.

The Indianapolis Rolling Mill is re-rolling iron rails for the Indianapolis & St. Louis road.

The first locomotive ever built in Nebraska was recently turned out of the Plattsmouth shops of the Burlington & Missouri River Railroad in Nebraska.

### Bridge Notes.

The Kellogg Bridge Co., of Buffalo, N. Y., has an order for 26 spans of iron bridges for the Kansas City, St. Louis & Chicago, the Chicago & Alton's new line to Kansas City. The work is to be begun at once and pushed as fast as possible. Since Jan. 1 the company has shipped 3,000 tons of finished bridge material.

Murray, Dougal & Co., at Milton, Pa., have just finished a wrought-iron highway bridge, 55 ft. span, over Sauquoit Creek, at New Hartford, N. Y.

Messrs. J. R. Jones and S. T. Benner, both until recently

in the Philadelphia office of the Keystone Bridge Co., have gone into partnership as consulting engineers and contractors for iron bridges. Their office is at No. 218 South Fourth street, Philadelphia.

### Notes.

An imaginative Kentuckian wants to build a road through Oregon, Washington, British Columbia and Alaska to Behring's Straits; by steam ferry across the straits and then by another railroad through Siberia and Russia to St. Petersburg, connecting by the way with the European railroad system.

The *Peoria Transcript* adds the Illinois Midland to the list of unfortunate "Midland" roads. The Virginia Midland is yet another illustration of the unvarying bad luck that follows the name.

With what extreme cheapness could a railroad be worked in China, where section hands and brakemen could be hired for six or seven cents a day, and the Superintendent's salary would be about \$250 a year. But then a Chinaman would expect to be carried for about one-tenth of a cent per mile.

A genius in Mobile proposes a sleeping car without berths for summer and warm climates. The day seats are to be made to fold up out of the way, and hammocks are to be hung in rows on suitable posts provided for the purpose. If his plan is adopted travelers will need a little gymnastic practice, for it is very easy to pitch out on one's head if one does not understand how to get into a hammock.

The narrow-gauge is a house divided against itself. Three feet is favored by the majority, but 3 ft. 6 in. has some advocates, 2 ft. is favored by many, especially in New England, and now a Missouri man is writing in favor of 18 in. gauge, and declaims against the extravagance and unnecessary dead-weight of the 3 ft. roads.

"You want to brake on this road, do you? Well, you can sit down there. We have no vacancy just at present, but then we kill one or two brakemen a day, and I dare say in a few minutes I shall hear of some one losing an arm or a leg, and then you can have the job." The man thought he wouldn't wait, and was afterward seen negotiating for a job as deck-hand on a canal boat. He said canalizing wasn't so exciting as railroading, but then it was safer.

### Government Contracts.

Lieutenant-Colonel John Newton, United States Engineers, will receive at his office, United States Army Building, New York, until Aug. 24, proposals for building a pile dyke in the Hudson River at Rondout, N. Y.

Major G. K. Warren, United States Engineers, will receive at his office in Newport, R. I., until Aug. 20, proposals for dredging in Providence River in Rhode Island, Little Narragansett Bay in Rhode Island and Connecticut, and in Salmon River in Connecticut. Also for rip-rap granite for Hyannis breakwater, in Massachusetts, and for the jetty at Saybrook Bar, at the mouth of the Connecticut River.

Capt. A. N. Damrell, United States Engineers, will receive at his office in Mobile, Ala., until Sept. 10, proposals for dredging in the harbor of Cedar Keys, Fla.

### Tramps.

A Stockton (Cal.) dispatch of Aug. 9, says that fifteen tramps attempted to board a west-bound train on Thursday evening, but were driven off by the train hands. The tramps assaulted the hands with clubs and stones, and their leader fired two shots without effect at the rear brakeman. The latter returned the fire, inflicting a wound from which the tramp died the next day. The brakeman was exonerated by the coroner's jury and discharged.

### Refrigerator Cars in Europe.

The Tiffany refrigerator car built in Vienna, Austria, some weeks since was sent from Vienna to Paris, loaded with dressed beef. It was five days on the road and the beef arrived in excellent condition. Parties in Paris are now arranging to have more cars built to be used on the same route.

### Natives in Railroad Employ in India.

The supplement to the last *Gazette of India* contains some interesting statistics of the number of servants of all races employed on the different railway lines in India. The grand total for 7,278 miles of line is 132,040, or between eight and nine individuals per mile. Of these 132,040 persons, 125,040 are natives, 3,319 are Eurasians (children of Europeans, but born in Asia), and 3,681 are Europeans. Again, of the total number 8,837, of whom 8,257 are natives, 271 Eurasians and 309 Europeans are employed in the department of general administration; 31,616, of whom 29,339 are natives, 1,233 Eurasians and 1,044 Europeans, in the traffic and telegraph departments; 52,259, of whom 51,631 are natives, 248 Eurasians and 380 Europeans in the engineer's department; and 39,328, of whom 35,887 are natives, 1,567 Eurasians and 1,874 Europeans, in the locomotive and carriage departments. The first thing that strikes us about these figures is the enormously large proportion of natives, not only in the total, but in every individual branch of the work. In fact, it may almost be said that the working of the railways is practically in the hands of the natives of the country—in some cases, but not in all, under European supervision. The insignificant number of Eurasians employed is hardly less striking. In one department alone—traffic and telegraph—does it exceed that of the Europeans. Turning again to the statistics of casualties, we find that among an average number of 3,513 Europeans employed in the year ending 30th September, 1877, there were only 83 deaths, while among an average number of 3,319 Eurasians employed there were only 39 deaths, giving about half as high a death rate for Eurasians as for Europeans. The dismissals were 289 and 256, respectively, showing no great disparity between the two classes.—*Englishman*.

### OLD AND NEW ROADS.

Altoona Coal & Iron Co.—This company is building a railroad of 3 ft. gauge from Martin's Station on the Atlantic, Mississippi & Ohio road, in Pulaski County, Va., to the Altoona coal mines, a distance of 8½ miles. The survey of the road is nearly finished and three miles are ready for letting to contract.

Atlantic & St. Lawrence.—At the recent annual meeting of this company (which owns the Maine section of the Grand Trunk), it was voted to accept the act of the last Legislature increasing the capital stock by \$484,000. The directors were authorized to issue stock to that amount to provide for the payment of bonds maturing Nov. 1, 1878. It was also voted to modify the lease to the Grand Trunk, so that that company shall pay the interest on the new stock issued.

Baltimore & Cumberland Valley.—The required amount of stock having been subscribed, the organization of this company has been completed. A contract has already been let to Dacey Brothers, of Boston, for the section of nine miles from the junction with the Western Maryland road at Welty's, Md., northwest to Waynesboro, Pa. From that

place the road will be continued to Chambersburg and Shippenburg as soon as subscriptions to a sufficient amount can be secured. The road is built as a branch of the Western Maryland, and to secure for that road a part of the traffic of the Cumberland Valley.

Baltimore & Ohio.—Freight business is reported so heavy on this road that 10 additional engines have been put on the Parkersburg Division. On the Main Stem also, the freight runs east from Benwood have been about doubled. The increased traffic is chiefly in grain to Baltimore.

Bellaire & Southwestern.—A second locomotive and a supply of iron have been received. Tracklaying on the extension from Wegee, O., toward Woodfields has been resumed and is being pushed forward.

Bold Train Robbery.—Four men boarded the baggage car of a train on the Kansas City, St. Joseph & Council Bluffs road at Winthrop, Mo., about 1:30 o'clock on the morning of Aug. 13, and just after the train started they entered the car, in which were the conductor, baggage-master, express messenger and another man. They captured these four men one after the other, intimidating them with drawn revolvers, took \$5,100 from the express safe, forced the conductor to pull the bell-rope and stop the train, and then jumped off and disappeared in the woods. The whole affair did not take more than five minutes, and seemed to have been carefully planned beforehand.

Brattleboro & Whitehall.—Mr. C. F. Thompson, President, will receive at his office in Brattleboro, Vt., until Aug. 26, proposals for the construction of this road from Brattleboro to South Londonderry, 35 miles. The road will be of 2 ft. gauge. Proposals may be made for the construction and equipment complete, or in part. Plans, profile and specifications can be seen at the office in Brattleboro.

Burlington, & Missouri River, in Nebraska.—It is said that this company is making arrangements to build a bridge over the Missouri River at Plattsmouth. The traffic of the road is now so large that the ferry transfer at Plattsmouth causes serious delay and inconvenience.

Camden, Gloucester & Mt. Ephraim.—This company has resolved to extend its road from its present terminus at Mt. Ephraim, N. J., southward through Blackwoodtown to Turnersville, about eight miles. The extension is through a good country, and will reach several large flouring mills.

Chatfield.—This road has been permanently located and grading will be begun very soon. It will be 12 miles long, from the Winona & St. Peter near Eyota, Minn., south to Chatfield. It will be a branch of the Winona & St. Peter, the Chicago & Northwestern furnishing aid in its construction.

Chicago, Burlington & Quincy.—Work has been begun on the second track between Malden, Ill., and Arlington, seven miles. The completion of this section will give the company a double track from Chicago to Princeton, 106 miles.

Chicago, Milwaukee & St. Paul.—A strike took place among the workmen in the Milwaukee shops of this company on Aug. 10, in consequence of a reduction in wages. The officers of the company claim that the reduction was small and made chiefly to equalize wages. A committee was appointed by the men to see the officers, but, owing to some misunderstanding, no meeting was held, and on Aug. 12 the shops were kept closed by order of the company. On the following day, however, the committee met General Manager Merrill and the men agreed to return to work at the new wages, the company promising not to discharge any one on account of the strike. Work was resumed accordingly on Aug. 14.

Cincinnati Southern.—At the election held Aug. 14 the people of Cincinnati voted, by a majority of 5,790 to authorize the issue of \$2,000,000 additional bonds for the purpose of completing the road, under the contract lately made by the trustees with R. G. Huston & Co. The amount of the contract is \$1,672,000, and in addition \$50,000 is to be expended for terminal facilities in Cincinnati. The rest of the \$2,000,000 will probably be used to equip the road.

In the Superior Court in Cincinnati, Aug. 6, a petition was filed, asking for an injunction to restrain the city officers from paying the expenses of the special election, which is to be held Aug. 14, on the question of issuing \$2,000,000 additional bonds to complete the road. The petition further asks for an order to compel the trustees to turn over to the city all money received from the road. It is signed by a number of citizens, who oppose any further grant of money on bonds to the trustees.

Clarksburg, Weston & Glenville.—This company has filed articles of incorporation in West Virginia for a railroad from the Baltimore & Ohio at Clarksburg south to Weston, and thence west to Glenville in Gilmer County. The distance is about 50 miles, and about half of the road is on the line of the proposed Weston & West Fork road. The capital stock is \$100,000, with power to increase; the incorporators are J. N. Camden, John V. Rathbone, Henry Brannon, Thomas A. Edwards, W. N. Chancellor, A. H. Kunst, J. M. Bennett, T. B. Camden and A. A. Lewis.

Columbus, Chicago & Indiana Central.—Justice Harlan, of the United States Supreme Court, sitting as Circuit Judge, on Aug. 13 began the hearing of arguments in the various suits relating to the lease of this road to the Pittsburgh, Cincinnati & St. Louis. The first suit is the one begun by the lessee to set aside the lease, but there are several other suits and cross-bills to be tried, all depending on the validity of the lease and the liability of the Pennsylvania Railroad Company as guarantor.

Dayton & Southeastern.—Mr. F. Sprague, Auditor and Cashier, writes us as follows:

"On the 8th inst., upon petition of the Trustees for the bondholders *et al*, this road was placed in the hands of Mr. John E. Gimperling as Receiver, with full powers.

"Under his management all arrears of interest will soon be paid, as the road is doing a fair and increasing business. Annual interest now \$29,000; July earnings, net, \$3,500, not expected to be less per month, but increasing. Floating debt will be paid in due time and road extended to Wells-ton, 115 miles, at an early day."

The road, which is of 3 ft. gauge, is completed from Dayton, O., to the crossing of the Marietta & Cincinnati at Musselmans, a distance of 69 miles.

Des Moines, Adel & Western.—Work has been begun on a section of this road about eight miles long, from Adel, the county seat of Dallas County, Ia., eastward to Waukee, on the Des Moines & Fort Dodge road.

Des Moines & Knoxville.—This company has been organized to build a road from Des Moines, Ia., southeast to Knoxville, about 33 miles. The object is to connect Des Moines with the Chicago, Burlington & Quincy road, which has a branch to Knoxville.

Detroit & Milwaukee.—The Wayne Circuit Court has decided to appoint Robert P. Toms trustee under the first



mortgage, in place of A. H. Sibley, deceased. This appointment is considered favorable to those bondholders who have agreed to the plan of reorganization.

The bondholders opposed to the plan will soon, it is said, file a bill to review the decree of foreclosure and sale.

The following order was recently issued by Superintendent S. R. Callaway:

"A supply of blank manifold train order sheets will be supplied to all stations with this. In receiving train orders from Train Dispatchers, operators will copy the original order on the manifold paper, making three impressions. The conductor will then be required to write his 32 across the face of the order. Under no circumstances must the order as sent by the Train Dispatcher be copied on anything but the manifold train order form. One copy will be retained by the operator, one by the conductor, and one handed to the engineer.

"The same rule will apply to holding orders for trains."

Receiver Trowbridge's report for July is as follows:

Nominal balance, June 20.....	\$40,853.54
Receipts.....	83,199.89
Total.....	\$124,053.43
Disbursements.....	88,181.23
Balance, July 31.....	\$35,872.20

The disbursements exceeded the receipts by \$4,981.34. The total amount of Receiver's notes and certificates outstanding July 31 was \$346,598.70.

**East River Bridge.**—The trustees last week ordered all work on the bridge to be stopped and laid off all the men employed except watchmen to protect the property. This action is taken in consequence of the refusal of the city authorities of New York to make an appropriation of money as called for by the trustees.

**Galena & Southern Wisconsin.**—The bondholders have taken action to foreclose the mortgage on this road. The company is said to be completely insolvent, and no trains have been run for several weeks. At a recent meeting the stockholders adopted resolutions denouncing the management and calling a special meeting to elect new directors. The road is of 3 ft. gauge, and runs from Galena, Ill., to McCormack's, Wis., 40 miles.

**Georgia.**—This company has recently contracted for 1,200 tons of steel rails at about \$46 per ton, delivered. They will be laid on the Atlanta end of the road, and will, with those heretofore laid, make about 45 miles of steel in the main track.

**Grand Trunk.**—A Montreal dispatch says that during Mr. Vanderbilt's recent visit to that city, arrangements were made for a meeting to be held at Saratoga, Aug. 20, to settle the relations between this road and the Michigan Central. Mr. Vanderbilt is said to have expressed his willingness to give the Grand Trunk all necessary accommodation over the Central.

**Hartford, Providence & Fishkill.**—The city of Hartford, Conn., in 1856 issued \$500,000 of its 6 per cent. bonds in aid of this road, receiving in exchange an equal amount of the company's 7 per cent. bonds, the difference in interest being applied to a sinking fund. The New York & New England Company recently gave notice of its intention to pay off or provide for the Hartford, Providence & Fishkill bonds and take possession of the road under the old contract between the companies. The Hartford sinking fund now amounts to \$248,000, and the New York & New England claims that this must be allowed as an offset, so that only \$252,000 will have to be paid. It is thought that the claim must be allowed.

**Illinois Central.**—The car repair shop at Dubuque, Ia., was burned down, Aug. 9. All the contents were destroyed and also eight freight cars, which stood on a siding by the shop. The loss is estimated at \$12,000.

The Land Department reports that during the month of July 478.06 acres of land were sold for \$3,420.42. The cash collected on land contracts was \$3,621.05.

The traffic on the lines in Illinois was \$460,698, against \$398,666.60 in July, 1877, an increase of \$62,031.40, or 15.6 per cent. There was also an increase on the Iowa Division of \$13,346.10, making the gain in both States for the month \$75,377.50.

**Illinois Midland.**—Richard J. Rees, Receiver of this road, will receive at his office in Paris, Ill., until Aug. 26, bids for Receiver's certificates of the amount of \$1,000 each. The certificates are issued by order of the Court, for the purpose of paying taxes now due in Illinois. The amount to be issued is limited by the order to \$65,000. They are made a first lien on the property, are to bear 10 per cent. interest, and are made payable in two years, or sooner, at the option of the Receiver.

**Illinois & St. Louis.**—In spite of opposition from the local authorities, this company has succeeded in laying a connecting track from its road in East St. Louis to the Illinois & St. Louis Bridge. The connection is nearly a mile long and will enable the company to send its coal cars across the bridge into St. Louis.

**Indianapolis, Bloomington & Western.**—The company organized by some of the bondholders to buy in the Main Line has resolved to ask a postponement of the sale, in order that the plan of reorganization may be perfected and the assent of the bondholders secured.

**Iowa City & Western.**—This company has filed articles of incorporation in Iowa. The capital stock is \$2,000,000, and the office is at Iowa City, Iowa.

**Kansas Pacific.**—The following statement for the six months ending June 30 is published:

	Gross earn.	Expenses.	Net earn.	Earn. per mile.	P. c. of exps.
First mortgage division (140 miles).....	\$900,903	\$324,757	\$576,146	\$4,721	49.13
Second mortgage division (254 miles).....	443,642	338,471	105,171	1,747	76.30
Third mortgage division (245 miles).....	244,655	334,765	90,110	900	136.81
Total main line (639 miles).....	\$1,349,200	\$997,993	\$351,297	\$2,111	73.96

\* Deficit.

This statement apparently does not include the Leavenworth Branch (34 miles), which forms a separate mortgage division. The first mortgage division is the 140 miles from Kansas City westward; the second mortgage division is from the 140th to the 394th mile-post, and the third mortgage division is the western end of the road, known as the Denver Extension.

A bill has been filed in the United States Circuit Court at Topeka, Kan., to foreclose the second land-grant mortgage. The object of this new proceeding is said to be chiefly to test the recent decision of the Secretary of the Interior in the Dudymott case. The company's claim

is that the mortgaging of the lands to secure an issue of bonds is disposing of them within the meaning of the law, and this claim can probably be passed upon in an action to foreclose the mortgage.

**Lick Mineral.**—This road is now under construction. It will be 1 1/4 miles long, from the Springfield, Jackson & Pomeroy road to the Hill coal mines in Jackson County, O. It is built by Price Brothers, of Jackson, O., who have bought the Hill mines, and expect to work them extensively.

**Martin's Creek.**—It is stated that the amount of subscriptions required has been secured, and that work will soon be begun on this road. It is to run from Bangor, Pa., east by south down Martin's Creek to and across the Delaware, connecting with the Belvidere Division of the Pennsylvania at Martin's Creek, N. J. The distance is 10 miles. The road will be worked as a branch of the Belvidere Division, and will serve some large slate quarries.

**Minneapolis, St. Cloud & Sauk Rapids.**—This company has filed articles of incorporation in Minnesota to build a railroad from Minneapolis northward to St. Cloud on the west side of the Mississippi River. The distance is 62 miles, and the capital stock is to be \$200,100. The line is parallel to that of the St. Paul & Pacific and on the opposite side of the river. At Sauk Rapids, just above St. Cloud, the road will connect with the Western Railroad, formerly the Brainerd Branch, which is controlled by the Northern Pacific. The new company is also organized in the interest of the Northern Pacific, and the road, if built, will give that company a line to St. Paul independent of the St. Paul & Pacific.

**New York City & Northern.**—This company, successor to the old New York & Boston, has executed and recorded a mortgage for \$1,800,000, which is to be a first lien on the road from High Bridge, N. Y., the northern end of New York city, to Brewster, 50 miles. The company, at first known as the New York, Westchester & Putnam, was organized by the bondholders who bought the property mortgaged.

**New York Elevated.**—This company's east side line is now completed from the battery, in New York, as far as Third avenue and Fifty-ninth street, and the branch through Forty-second street to the Grand Central Depot is also ready for use. Trains have been run over this line, and a number of guests have been invited to an excursion over it, to take place Aug. 15. Regular trains will be put on the line in a few days. This part of the road is about five miles long.

**New York, Lake Erie & Western.**—A report came from Pittsburgh that this company has notified the other lines concerned that it will not be bound by the agreement for a division of the oil traffic, the company holding that it is not legally held by contracts made by the old company or the Receiver. It is further said that the company's design is to secure the whole traffic of the Bradford Region, which is now furnishing a large part of the oil sent to market. We learn that there is no foundation for the report further than that some slight modifications in the old arrangement are proposed for the reorganized company.

Work on the third rail on the Eastern and Delaware divisions is in progress. No rail has been laid yet, but the necessary changes in the frogs and switches are being made as fast as possible.

The third rail completing the standard-gauge track between Buffalo and Binghamton, and in connection with the Albany & Susquehanna road opening a new line between Buffalo and Albany, was laid this week.

Work is in progress on a second track on the Delaware Division between Pine Grove and Nobody's and between Lordville and Stockport, about 15 miles in all. A steam-hovel and train are employed in making the required fills.

Some experiments are being made on the Delaware Division to determine the tractive capacity of the freight engines in use. The coal used on this division is now carefully measured, and some experiments on the use of fuel are also in progress.

**New York & New England.**—This company has concluded a lease of a tract of 25 acres on South Boston Flats, belonging to the State of Massachusetts. The lease has still to be approved by the Governor and Council. The land is to be used for a passenger and freight station. The lease is for one year, renewable at the pleasure of the State, and the rent is to be \$6,000 a year.

**Paint Valley.**—This company has been organized to build a road from Chillicothe, O., a little south of west to Hillsboro, about 40 miles. The line will follow the valley of Paint Creek most of the way.

**Port Huron & Northwestern.**—The survey of this projected road has been completed, from Port Huron, Mich., north by west to Carsonville, about 60 miles. An easy line has been found for most of the way.

**Pratt Coal & Coke Co.**—This company is preparing to build a railroad six miles long from its coal mines in Jefferson County, Ala., east to Birmingham, where it will connect with the South & North Alabama and the Alabama Great Southern roads. The company owns 5,000 acres underlaid by an excellent quality of coal.

**Rockford, Milledgeville & Western.**—This company has filed articles of incorporation in Illinois for a railroad from Rockford west by south to the Mississippi River at or near Fulton, a distance of about 65 miles. The capital stock is fixed at \$800,000, and the principal incorporators are Miles B. Landon, A. H. Healy, H. Hickey, W. H. Colburn and others.

**St. Louis & Council Bluffs.**—This company has filed articles of incorporation in Iowa for a railroad from Pattonsburg, Mo., the terminus of the St. Louis, Council Bluffs & Omaha road, northwest to Council Bluffs, Ia. The distance is about 120 miles, and the capital stock is \$2,000,000.

**St. Paul & Pacific.**—The work of track-laying on the St. Vincent Extension is now progressing rapidly, and the company expects to have trains run through to Pembina by Oct. 1. On the Branch Line the tracklayers are now at work between Sau Centre, Minn., and Osakis.

Our Amsterdam correspondent says that notice has been given of a meeting called by holders of \$500,000 First Division bonds for the purpose of removing the trustees under the mortgage of April 1, 1871, in accordance with the terms of the mortgage, and appointing others in their place. The meeting is to be held Sept. 16, at the office of J. S. Kennedy & Co., in New York.

In Amsterdam, July 28, notice was given that the lists for selling the certificates were reopened until Aug. 10, conditions of sale to be the same as before and prices to be for Branch Line bonds, 75; Consolidated loan, 25; Main Line bonds, 30; loan of 1869, 35; St. Vincent Extension and Brainerd Branch, 11. The American-Canadian combination, which buys the bonds, reserved the right to fix the amount to be taken, bonds to have the preference in the order in which they were offered.

**Sonoma Valley.**—This company, as lately noted, was

organized to build a narrow-gauge road from Sonoma, Cal., to Tolay Creek, 14 miles. The road is to take the place of one built on the prismoidal or one-rail plan, part of which has been completed, but is now abandoned, the system not being found practicable or economical.

**Sonoma Railroads.**—General Rosecrans, Mr. J. R. Myers and several others recently made an examination of the lines proposed for two new railroads in the State of Sonoma, Mexico. The principal line is from Guaymas, on the Gulf of California, to Hermosillo, capital of the State, and thence to Tucson, Arizona, a distance of about 420 miles. Part of this line is said to be through a good agricultural country, and much of it through a very rich mineral country now little developed, partly on account of difficulty of transportation and partly from fear of the Apaches. The other line is from Guaymas east to some valuable coal fields on the Yuaka River, about 120 miles, through an excellent country.

**Texas & Pacific.**—The contract for grading the extension of the Transcontinental Division from Sherman, Tex., west to Whitesboro, 18 miles, has been let to J. E. Haden, of Pilot Point, Tex. Five miles of this extension are part of the line from Sherman to Fort Worth.

**Union Pacific.**—The following is the text of the circular recently referred to, relating to the Secretary of the Interior's decision on Pacific land grants; it is dated July 29, and signed by Leavitt Burnham, Land Commissioner, and S. H. Clark, General Superintendent:

"To whom it may concern: In view of the misunderstandings that have arisen, and misrepresentations that have been made concerning the late land decision of the Secretary of the Interior, we submit the following:

"1. The decision does not hold that all railroad lands unsold at the end of three years from completion of the road are thrown open to preemption, or that they then revert to the body of the public lands, but simply states that lands not sold or disposed of at that time are subject to such entry.

"2. The decision does not assume to determine what constitutes a disposal of said lands.

"3. It is the written opinion of the most eminent legal authorities of the country that the lands have been disposed of in the manner contemplated by the language of Sec. 3, act 1862, Pacific Railroad charter, and are not subject to preemption entry.

"4. We place ourselves on this opinion, and shall proceed to handle and sell our lands in the same manner as heretofore, our right and authority to do so not being in any way impaired by the decision.

"5. Each and every case in which any person files upon, occupies, or in any manner attempts to interfere with our rights and interests in any of these lands will be promptly litigated to the court of last resort."

**Vaca Valley & Clear Lake.**—San Francisco dispatches state that a receiver has been appointed for this road, on application of the creditors. The embarrassments of the company are caused by the failure of T. L. Mansfield, a large grain-dealer of Winters, Cal., who is the chief owner of the road. The road is 30 miles long, from Elmira, Cal., to Madison; it was built to Winters, 18 miles, in 1875, and extended to Madison in 1877.

**Valley, of Ohio.**—Work on this road, which has been suspended for several years, is to be resumed. A contract was last week concluded with Redmond Walsh, of Rochester, Pa., and Daniel Brennan, of Youngstown, O., who are to complete the road (with the exception of the rails and bridges) from Cleveland, O., southward to Canton, 56 miles. The work is to be done by Jan. 1, 1879, and the contract price is \$119,000, one-fourth payable in bonds. A large part of the grading was done four years ago. Work was to be begun in Cleveland this week, and it has been decided to use the abandoned canal bed as an entrance into that city. The company has, it is said, succeeded in selling \$350,000 first-mortgage bonds at 75, and is now trying to dispose of \$75,000 more to buy equipment with. The whole issue authorized is \$450,000.

## ANNUAL REPORTS.

### St. Paul & Sioux City.

This company owns a line from St. Paul, Minn., southwest to St. James, 122 miles; it is extended to Sioux City, Ia., by the Sioux City & St. Paul, which has the same management and substantially the same ownership. The company also owns a two-thirds interest in the Worthington & Sioux Falls road, 63 miles. The report is for the year ending Dec. 31.

The equipment consists of 15 engines; 6 passenger and 4 baggage cars; 292 box, 63 flat and 10 caboose cars, and one-half interest in a business or pay car.

The Land Department reports the land grant at 926,906 acres, of which 854,269 have been patented to the company. The total sales up to the end of 1877 were 199,440 acres; receipts on principal and interest of land contracts, \$1,082,756. Sales for 1877 were 35,475 acres for \$254,983.47; cash received on land contracts, \$185,374.72. Proceeds of the lands are used in extinguishing preferred stock.

The general statement is as follows:

Stock (\$19.672 per mile).....	\$2,400,000.00
Preferred stock and scrip (\$18.121 per mile).....	2,210,742.82
Floating debt.....	153,165.57
Profit and loss.....	27,700.31
Total (\$39.292 per mile).....	\$4,791,608.70
Road, etc. (\$37.173 per mile).....	\$4,535,131.01
Stocks and bonds.....	50,190.42
Real estate and free land contracts.....	197,441.44
Bills receivable.....	2,845.83
	4,791,608.70

Cost of road was charged with \$43,336.95 during the year, for new sidings and other improvements. The traffic of the year was as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Locomotive mileage.....	343,748	347,704	D.	3.956
Average per engine.....	22,916	23,180	D.	264
Passengers carried.....	60,434	59,680	I.	754
Passenger mileage.....	2,775,440	2,725,036	I.	50,413
Tons freight carried.....	190,924	196,453	D.	5,529
Tonnage mileage.....	16,495,309	16,544,909	D.	49,600

Some statistics of traffic were as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Mileage of trains.....	91,553	163,388		
Av. No. cars per train.....	4.0	14.7		14.8
Av. No. pass. or tons per train.....	30.0	101.0		100.6
Av. receipt per train mile.....	149.00 cts.	249.00 cts.		156.00 cts.
Av. net per train mile.....	32.00 "	104.00 "		38.00 "
Av. per ton or pass. per mile.....	4.28 "	2.42 "		4.52 "
Av. net per ton or pass. per mile.....	0.43 "	1.03 "		1.08 "

The freight traffic was more evenly divided than on most Western roads; 59.3 per cent. was of west-bound and 40.7 per cent. of east-bound freight. This results from the large lumber traffic. Of the total tonnage 35.8 per cent. was



lumber and 27.8 per cent. wheat and flour. The average earnings and cost per car mile were:

	Passenger.	Freight.
Earnings per mile, cents.....	55.90	18.58
Cost of repairs per mile, cents.....	2.10	0.71
Total mileage of cars.....	212,709	2,407,590
Average miles per car.....	42,542	6,597

The mileage of loaded cars was 74.4 per cent. of the total freight car mileage; average load per loaded car, 8.7 tons. The decrease in rates per ton per mile was in part from competition and partly from the greater lumber traffic, which is carried at low rates.

The earnings for the year were as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Freight.....	\$390,203.74	\$427,217.31	D. \$37,013.57	6.6
Passage.....	118,821.82	123,246.85	D. 4,425.03	3.6
Express, mail, etc.....	25,519.49	23,293.91	I. 2,225.58	9.6
Total.....	\$534,545.05	\$573,758.07	D. \$39,213.02	5.3
Expenses.....	337,332.66	351,677.97	D. 14,345.31	4.0
Net earnings.....	\$206,212.39	\$222,080.10	D. \$15,867.71	7.0
Gross earn. per mile.....	4,455.30	4,702.93	D. 247.63	5.3
Net ".....	1,690.26	1,820.33	D. 130.07	7.0
Per cent. of exps.....	62.00	61.30	I. 0.70	1.1

The income account (condensed) was as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Balance, Jan. 1, 1877.....	\$29,101.93			
Net earnings.....	206,212.39			
Rents, premiums, etc.....	7,583.14			
Total.....	\$242,897.46			
Tax on gross earnings, insurance, etc.....	\$19,410.29			
Interest and dividends on preferred stock.....	194,754.61			
Loss from fire, etc.....	1,032.25			
Total.....	\$215,197.15			
Balance, Jan. 1, 1878.....	\$27,700.31			

Grasshoppers and light crops reduced the earnings for the first eight months; the last four months showed a great increase, but not enough to overcome the previous loss. During the year 591 tons steel, 597 tons iron and 88,414 ties were used in renewals. Many permanent improvements were made by substituting stone culverts and earth filling for pile or trestle bridges. The Worthington & Sioux Falls road promises to be a good investment.

#### Chicago & Northwestern.

The roads owned and worked by this company at the close of the fiscal year ending May 31, 1878, were as follows:

	Miles.
Chicago & Northwestern and branches (consolidated).....	1,174.36
Chicago & Milwaukee (owned, but not consolidated).....	85.00
Chicago, Iowa & Nebraska and Cedar Rapids & Missouri River (Clinton to Council Bluffs and branch) leased perpetually.....	356.60
Total, Chicago & Northwestern proper.....	1,615.96
Proprietary roads:	
Winona & St. Peter.....	327.00
Winona, Mankato & New Ulm.....	3.75
Northwestern Union.....	68.80
Iowa Midland.....	62.63
Total.....	462.18

The Chicago & Northwestern proper was increased by the 29 miles of the La Crosse, Trempealeau & Prescott, formerly a proprietary road, but consolidated during the year; by the building of the Menominee River Branch of the Peninsula Division, 24.71 miles, and of the Maple River Branch in Iowa, 60.15 miles, both these branches being perpetually leased. The new road was brought into use at various times during the year, making the average mileage worked 1,574.80 miles for the Northwestern proper, or 2,036.98 miles for all lines.

The equipment for the whole system was 369 engines; 2 parlor, 149 first and 29 second-class passenger, 69 baggage and 15 mail cars; 5,366 box, 604 stock, 1,108 flat, 1,957 iron ore and 142 caboose cars; 4 business cars, 13 wrecking, 66 road and 18 boarding cars. There was an increase of 200 box, 100 stock, 150 flat and 1 wrecking car. The title to 27 engines, 7 passenger and 2 baggage cars, 893 box, 133 flat and 2 caboose cars is in the Winona & St. Peter Company.

The company's land grants were increased by 94,247.97 acres granted by the State of Michigan for the Menominee River road. Sales of land were 92,144.41 acres for \$441,728.53, besides town lots for \$2,460. Cash receipts on land contracts, etc., were \$180,456.80. The total amount of land held by the company at the close of the year was 2,225,339.48 acres, and there is a further claim to some Winona & St. Peter lands in Minnesota now in dispute. Sales have increased very largely over previous years, especially in Minnesota.

The statement of general account is as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Common stock (deducting \$130,848.48 held by Co., \$14,988,807.49)				
Preferred stock (deducting \$177,241.84 held by Co.).....	\$1,525,602.72			
Total stock.....	\$36,514,410.21			
Chicago & Northwestern currency bonds.....	\$12,000,000			
Chicago & Northwestern gold bonds.....	18,193,000			
Chicago & Milwaukee bonds.....	1,700,000			
Real estate mortgages.....	32,793,000.00			
Due leased roads in Iowa.....	228,000.00			
Bills and accounts, June coupons and dividends etc.....	3,112,492.83			
Income account, balance.....	4,177,015.16			
Total.....	\$77,088,350.28			
Construction accounts.....	\$71,038,234.69			
Proprietary roads.....	1,635,659.57			
Cash and assets, materials, balances, etc.....	3,416,885.69			
Stocks and bonds.....	997,760.33			
Total.....	\$77,088,350.28			

There was no material change in the stock; \$20 in scrip was issued in taking up old Galena & Chicago Union stock and \$6,500 for Peninsula Convertible bonds. By the terms of consolidation with the La Crosse, Trempealeau & Prescott, that company surrendered \$500,000 of its paid up stock, for which \$500,000 Chicago & Northwestern preferred stock is to be issued at the convenience of the company. During the year \$238,000 old divisional bonds were taken up and consolidated bonds issued therefor. The \$1,000,000 first-mortgage 10 per cent. bonds of the La Crosse, Trempealeau & Prescott were paid off April 1, 1878, and an equal amount of Chicago & Northwestern consolidated bonds issued in their place. The capital accounts of the proprietary roads are as follows:

	Stock.	Bonds.	for advances.	Total.
Winona & St. Peter.....	\$410,030	\$8,775,000	\$1,361,641	\$10,546,671
Winona, Mankato & New Ulm.....	100,000		72,409	172,409
Iowa Midland.....	44,948	1,350,000	92,419	1,487,367
Northwestern Union.....		3,500,000		3,500,000

The Menominee River road is represented by \$2,500 stock subscriptions and \$400,000 bonds. The annual interest charge of the Northwestern proper (including Menominee River bonds) is \$2,322,865; of the proprietary roads, \$967,250; so the debt stood at the close of the year.

On the Chicago & Northwestern proper there are now 751.29 miles of steel rails, of which 164.86 miles were laid during the year.

The traffic of the whole system was as follows:

	1877-78.	1876-77.	Inc. or Dec.	P. c.
Train mileage.....	1,877,778	1,876,777	I. 1,001	0.05
Passenger.....	2,681,733	2,632,981	I. 48,752	1.8
Freight.....	5,098,979	4,427,605	I. 671,374	15.2
Service.....	534,766	655,346	D. 120,580	18.4
Switching.....	1,983,207	1,915,172	I. 68,035	3.6
Total.....	10,208,325	9,631,104	I. 577,221	6.0
Cost of motive power per mile.....	21.60 cts.	22.12 cts.	D. 0.52 ct.	2.4
Receipt per train mile.....	151.00 cts.	145.20 " I.	5.80 cts.	4.0
Net per train mile.....	73.03 cts.	60.35 " I.	11.68 "	19.0
Passengers carried.....	3,416,413	3,347,833	I. 68,580	2.0
Passenger mileage.....	118,877,406	116,902,435	I. 1,974,971	1.7
Tons freight carried.....	3,911,261	3,413,398	I. 497,863	14.6
Tonnage mileage.....	623,768,593	485,357,900	I. 138,410,693	28.5
Av. train load.....	44.33	44.40	D. 0.07	0.2
Freight, tons.....	122.30	109.62	I. 12.68	11.6
Av. Receipt.....				
Per passenger.....	2.83 cts.	2.89 cts.	D. 0.06 ct.	2.1
Per ton per mile.....	1.72 "	1.80 "	D. 0.08 "	7.5

The total mileage of passenger cars was 12,270,628; freight cars, loaded and empty, 109,496,805. Average passenger train, 4.58 cars; average freight train, 21.47 cars.

The earnings of the Chicago & Northwestern proper (1,574.80 miles average) were as follows, the earnings of the La Crosse, Trempealeau & Prescott being included in both years, for purposes of comparison:

	1877-78.	1876-77.	Inc. or Dec.	P. c.
Passengers.....	\$2,978,720.25	\$3,066,305.67	D. \$87,575.42	2.8
Freight.....	10,016,920.72	8,415,598.96	I. 1,601,321.76	19.0
Express.....	248,766.66	248,275.46	I. 491.20	0.2
Mails.....	363,422.25	290,222.62	I. 73,199.63	9.2
Miscellaneous.....	76,008.36	65,754.12	I. 10,254.24	15.6
Total.....	\$13,583,847.24	\$12,086,156.83	I. \$1,497,690.41	12.4

Exps. and taxes..... \$6,756,126.46  
Net earnings..... 6,827,720.78  
Gross earn. per mile..... 8,925.76  
Net earn. per mile..... 4,335.61  
Per cent. of expenses..... 49.74

The earnings of the proprietary roads were:

	1877-78.	1876-77.	Inc. or Dec.	P. c.
Winona & St. Peter.....	\$791,240.04	\$573,666.01	I. \$217,574.03	37.9
Winona, Man. & New Ulm.....	4,423.60	3,604.49	I. 819.11	22.8
Northwestern Union.....	280,928.73	269,657.56	I. 11,271.17	4.2
Iowa Midland.....	90,622.88	100,017.07	D. 9,394.19	9.4
Total.....	\$1,167,215.25	\$946,945.13	I. \$220,270.12	23.3
Exps. and taxes.....	\$64,819.33			
Net earnings.....	\$302,395.92			

The earnings and expenses of the whole system were:

	1877-78.	1876-77.	Inc. or Dec.	P. c.
Gross earnings.....	\$14,751,062.40	\$13,033,101.96	I. \$1,717,960.44	13.2
Exps. fixed charges and all items.....	12,286,575.33	11,954,875.69	I. 331,699.64	2.8
Net profits.....	\$2,464,487.07	\$1,078,226.27	I. \$1,386,260.80	128.6
Gross earn. per mile.....	7,241.63	6,538.52	I. 703.11	10.8

The net earnings of the proprietary roads were \$302,395.92; interest and sinking funds, \$985,174.56; net loss, \$682,778.64.

The expenses of the Chicago & Northwestern proper are given in detail in the following table:

	Year ending May 31, 1877.	Year ending May 31, 1878.	Increase.	Decrease.
Repairs of Engines and Tenders.....	\$444,783.93	\$484,685.59	\$39,901.66	
Repairs of Cars.....	523,585.28	481,804.90	\$41,780.38	
Repairs of Buildings.....	92,148.98	115,400.54	23,251.56	
Repairs of Fences.....	65,374.28	65,658.80	284.52	
Gates and Crossings.....	230,377.89	241,127.51	1,749.62	
Repairs of Bridges and Culverts.....	1,300,419.12	1,259,925.75	\$40,493.37	
Repairs of Trackage.....	85,778.42	78,387.06	7,391.36	
Repairs of Tools and Machinery.....	753,761.37	773,646.30	19,885.13	
Fuel used by Locomotives.....	98,809.34	77,977.38	18,831.96	
Fuel and Lights used in Cars and at Stations.....	77,324.06	74,477.34	2,846.72	
Oil, Waste and Tallow used.....	47,809.87	50,007.88	2,198.01	
Office and Station Furniture and Fixtures for Cars.....	14,464.41	15,453.99	989.58	
Foreign Agents.....	53,456.19	53,308.40	147.79	
Advertising.....	30,471.84	30,926.48	454.64	
Stationery, Printed Blanks, Tickets, etc.....	42,146.74	41,650.33	496.41	
Engineers, Firemen and Wipers.....	635,871.03	655,888.60	20,017.57	
Conductors, Baggage men and Brakemen.....	400,575.24	420,632.95	20,057.71	
Laborers and Switchmen.....	621,013.53	599,871.10	21,142.43	
Agents and Clerks at Stations.....	588,465.00	610,856.33	22,391.33	
Superintendence.....	83,780.06	86,228.64	2,448.58	
Rents.....	17,978.04	21,358.85	3,380.81	
Loss and Damage.....	30,531.04	31,816.58	1,285.54	
Injury to Persons.....	68,067.84	42,240.55	25,827.29	
Teaming Freight, Baggage and Mails.....	6,651.24	4,124.55	2,526.69	
Miscellaneous Ex's.....	53,504.92	48,071.10	5,433.82	
Car Hire paid over amount received.....	34,408.93	68,797.19	34,388.26	
Total.....	\$6,394,558.59	\$6,450,873.84	\$56,315.25	
Add for Taxes.....	316,139.61	325,252.69	9,112.98	
Total.....	\$6,710,698.20	\$6,776,126.46	\$65,428.26	

The income account condensed is as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Balance of income, May 31, 1877.....	\$4,358,745.80			
Charged to profit and loss, old assets of no value, bad debts, shrinkages, etc.....	600,183.80			
Net balance from previous year.....	\$3,658,562.00			
Gross earnings.....	13,583,847.24			
Total.....	\$17,242,409.24			

Expenses and taxes..... \$6,756,126.46  
Interest and gold premium..... 2,384,020.49  
Sinking funds..... 83,120.00  
Rental of roads..... 1,213,219.02  
Dividends, 7 per cent. on preferred and 3 per cent. on common stock..... 1,958,034.00  
Accrued dividends on surrendered Galena & Chicago stock..... 95.47  
Advances to proprietary roads..... 682,778.04  
Total..... \$13,075,394.08

Balance, May 31, 1878..... \$4,177,015.16

The great increase in tonnage mileage was due partly to increase of tonnage and partly to a longer average haul, a great part of the larger tonnage coming from Minnesota and passing a longer distance over the company's lines. While the Chicago & Northwestern tonnage mileage increased 27.94 per cent., that of the Winona & St. Peter increased 56.74 per cent. The greater business, however, was accompanied by a reduction in rates; had the average rate of 1876-77 continued through the past year, the freight earnings would have been \$847,927.64 more than they actually were.

During the year new rails were laid on 215.5 miles of track, 164.86 miles being steel; 620,625 new ties were laid and the usual ballasting, ditching, etc., done.

Thirteen engines were rebuilt; 2 baggage, 200 box, 100 stock, 50 flat and one pile-driver car were built, and a large number of cars rebuilt. Many improvements to bridges and buildings were made, as given in detail in the report.

Expenditures on account of construction, including excess of cost of steel over iron rails, were \$572,807.41; for new equipment, \$196,541.05; new construction on proprietary lines, \$42,242.54. The Maple River and Menominee River roads have been completed and leased perpetually, and are included in the Northwestern proper. Aid has been extended to several roads projected as branches of the Winona & St. Peter, from Rochester, Minn., to Zumbrota and Plainview and from Sleepy Eye to Redwood Falls.

Arrangements have been concluded for exchange of business with the Burlington, Cedar Rapids & Northern, at Cedar Rapids, and the Chicago, Clinton, Dubuque & Minnesota, at Clinton. The amicable relations with the West Wisconsin have been continued with its successor, the Chicago, St. Paul & Minneapolis Company.

The increase in business and earnings has been due chiefly to the growth of local business, partly from good crops, partly from increase of settlement. The actual net revenue for the year was equivalent to 7 per cent. on the preferred and 6.4 per cent. on the common stock.

#### Sioux City & St. Paul.

This company owns a line from St. James, Minn., southwest to Le Mars, Ia., 124 miles, and leases the use of the Illinois Central track thence to Sioux City, 24 miles, making 148 miles worked. It is an extension of the St. Paul & Sioux City and is under the same management. The company owns one-third interest in the Worthington & Sioux Falls road, 63 miles. The report is for the year ending Dec. 31.

The equipment consists of 13 locomotives; 6 passenger and 5 baggage cars; 285 box, 93 flat and 7 caboose cars, and one-half interest in a business car.

The Land Department reports a total grant of 638,313 acres, of which 551,149 acres have been deeded to the company. Total sales have been 144,192 acres, of which 40,665 acres were sold during 1877, for \$200,081.60. Total receipts for principal and interest have been \$918,923.51, of which \$181,462.12 was received in 1877. From land sales \$646,000 bonds have been canceled.

The general balance sheet is as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Stock (\$22.581 per mile).....	\$2,800,000.00			
Bonds (\$21.514 per mile).....	2,967,740.00			
Floating debt.....	37,637.02			
Profit and loss.....	50,443.40			
Total (\$44,805 per mile).....	\$5,555,820.42			
Road, etc. (\$43,819 per mile).....	\$5,433,331.11			
Stocks and bonds.....	14,800.00			
Real estate and town lot contracts.....	44,067.84			
Accounts and balances.....	62,821.40			
Total.....	\$5,555,820.42			

The bonded debt consists of \$1,740,000 first-mortgage, \$214,080 first-mortgage income, \$503,000 second-mortgage, \$79,160 second-mortgage income and \$131,500 equipment bonds. The road does not earn the interest, and it is suggested that part of the bonds be converted into preferred stock.

The traffic of the year was as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Locomotive mileage.....	305,738	281,285	I. 24,453	8.7